

WAC 296-31-067 When is concurrent treatment allowed? (1) In some cases, treatment by more than one provider may be allowed by the crime victims compensation program. We may authorize concurrent treatment on an individual basis:

(a) If the accepted condition requires specialty or multi-disciplinary care.

Note: Individual and group counseling sessions given by more than one provider is not concurrent treatment.

(b) If we receive and approve your written request that contains:

(i) The name, address, discipline, and specialty of each provider requested to assist in treating the client;

(ii) An outline of each provider's responsibility in the case; and

(iii) An estimated length for the period of concurrent treatment.

(2) If we approve concurrent treatment, we will recognize one primary attending mental health treatment provider. That provider will be responsible for:

(a) Directing the overall treatment program for the client;

(b) Providing us with copies of all reports received from involved providers; and

(c) In time loss cases, providing us with adequate evidence certifying the claimant's inability to work.

[Statutory Authority: RCW 7.68.030 and 51.04.030. 99-20-031, § 296-31-067, filed 9/29/99, effective 11/1/99.]

WAC 296-31-068 When can a client transfer providers? (1) RCW 51.36.010 provides that clients are entitled to a free choice of attending providers, subject to the limits of RCW 7.68.130 and the requirements of the claimant's public or private insurance. The provider must meet registration requirements of WAC 296-31-030.

(2) The department must be notified if a client changes providers.

(3) We may require a client to select another provider for treatment under the following conditions:

(a) When a provider, qualified and available to provide treatment, is more conveniently located;

(b) When the attending provider fails to comply with our rules;

(c) Subject to the limits of RCW 7.68.130 outlined in subsection (1) of this section.

[Statutory Authority: RCW 7.68.030, 7.68.130 and 51.36.010. 99-20-031, § 296-31-068, filed 9/29/99, effective 11/1/99.]

WAC 296-31-069 For what reasons may the department require independent mental health or independent medical evaluations be obtained? Independent medical and mental health evaluations may be required by the department for the following reasons:

(1) To rate permanent impairment when treatment has been concluded; or

(2) To evaluate an application to reopen a claim; or

(3) To determine if there are conditions related to the effects of the crime or preexisting conditions aggravated by the crime for which the claim was filed; or

(4) To determine if crime-related treatment is still necessary and if present treatment is effective; or

(5) To determine if treatment is still leading to recovery; or

(6) To obtain other information that may be necessary for the department to make decisions on the victim's claim.

[Statutory Authority: RCW 7.68.030, 51.04.030, 51.32.112, 51.32.114. 00-24-065, § 296-31-069, filed 12/1/00, effective 1/1/01. Statutory Authority: RCW 7.68.030, 7.68.070, 51.32.110, 51.04.020(1) and 51.04.030. 98-24-095, § 296-31-069, filed 12/1/98, effective 1/1/99. Statutory Authority: RCW 7.68.030, 51.04.020(1) and 51.04.030. 95-15-004, § 296-31-069, filed 7/5/95, effective 8/5/95. Statutory Authority: RCW 43.22.050. 92-23-033, § 296-31-069, filed 11/13/92, effective 12/14/92.]

WAC 296-31-06901 What is required in an independent mental health evaluation report? Practitioners participating in an independent mental health evaluation ordered by the department must provide the crime victims compensation program with a report within thirty days following the evaluation date. The report must meet the guidelines published in the *Independent Mental Health Evaluators' Handbook*.

[Statutory Authority: RCW 7.68.030, 51.04.030, 51.32.112, 51.32.114. 00-24-065, § 296-31-06901, filed 12/1/00, effective 1/1/01.]

WAC 296-31-06903 Who may perform independent mental health evaluations for the crime victims compensation program? Providers who wish to perform independent mental health evaluations for the crime victims compensation program must be approved examiners and meet the following minimum qualifications:

Counselors	<ul style="list-style-type: none"> ■ Masters or doctorate degree in a field of study related to mental health; and ■ Certified by the Washington department of health as a social worker, mental health counselor or marriage and family therapist.
Advanced registered nurse practitioners	<ul style="list-style-type: none"> ■ Licensed with the Washington department of health; and ■ Have a specialty in psychiatric and mental health nursing.
Psychologists	<ul style="list-style-type: none"> ■ Licensed with the Washington department of health; or ■ Licensed within Oregon or Idaho by that state's health care licensing authority.
Psychiatrists	<ul style="list-style-type: none"> ■ Board certified; and ■ Licensed with the Washington department of health; or ■ Licensed within Oregon or Idaho by that state's health care licensing authority.
All examiners must have	<ul style="list-style-type: none"> ■ An active practice; or ■ Be a clinical supervisor in an active practice; ■ Five years post licensure clinical experience treating crime victims; or ■ Three years clinical experience treating crime victims and two years supervising clinical work. <p>Note: Geographic need of the program may substitute for some of the above experience requirements.</p>

[Statutory Authority: RCW 7.68.030, 51.04.030, 51.32.112, 51.32.114. 00-24-065, § 296-31-06903, filed 12/1/00, effective 1/1/01.]

WAC 296-31-06905 How does a provider become an approved examiner to perform independent mental health evaluations for the crime victims compensation program? Providers must submit a completed independent mental health evaluator application to the crime victims compensation program. Applications and standards for independent mental health evaluations are published in the *Independent Mental Health Evaluators' Handbook*. Approved examiners will be included on the program's approved examiners list.

[Statutory Authority: RCW 7.68.030, 51.04.030, 51.32.112, 51.32.114. 00-24-065, § 296-31-06905, filed 12/1/00, effective 1/1/01.]

WAC 296-31-06907 What factors does the crime victims compensation program consider in approving or removing examiners from the approved examiners list?

(1) The program may consider the following in approving examiners. The list is not inclusive.

- (a) Minimum qualifications established in WAC 296-31-06903;
- (b) Disciplinary proceeding or actions;
- (c) Experience in direct patient care and the area of specialty;
- (d) Geographic need of the program.

(2) The program may consider the following in removing examiners. The list is not inclusive.

- (a) Complaints about the conduct of the examiner;
- (b) Disciplinary proceeding or actions;
- (c) Ability to effectively convey and substantiate opinions and conclusions concerning victims;
- (d) Quality and timeliness of reports;
- (e) Availability and willingness to testify at the board of industrial insurance appeals if required;
- (f) Acceptance of the program's fee schedule rates.

[Statutory Authority: RCW 7.68.030, 51.04.030, 51.32.112, 51.32.114. 00-24-065, § 296-31-06907, filed 12/1/00, effective 1/1/01.]

WAC 296-31-06909 Is there a fee schedule for independent mental health evaluations? The maximum fee schedule for performing independent mental health evaluations is published in the *Independent Mental Health Evaluators' Handbook* available from the crime victims compensation program.

[Statutory Authority: RCW 7.68.030, 51.04.030, 51.32.112, 51.32.114. 00-24-065, § 296-31-06909, filed 12/1/00, effective 1/1/01.]

WAC 296-31-070 What are my general obligations as an approved mental health provider? (1) When treating a crime victim who comes under our jurisdiction, you agree to accept and comply with the *Crime Victims Compensation Program Mental Health Treatment Rules and Fees*.

(2) You must inform the client they may be entitled to benefits under the Crime Victims Act and provide whatever assistance is necessary for the client to apply for benefits. There is no charge for these services.

(3) It is the responsibility of the client to notify the provider if they believe their condition is related to a criminal act. If you discover a condition that you believe is crime

related, you must notify the client. It is your responsibility to determine if you are the first treating provider.

(4) If you are the first treating provider, you must:

- (a) Provide crisis intervention as necessary;
- (b) Provide instructions or help the client complete their portion of the application for benefits; and
- (c) Continue necessary treatment according to our mental health rules if the client remains in your care.

(5) If you are not the first treating provider, you should ask the client if an application for benefits has been filed for the condition.

(a) If an application for benefits has been filed, and you and the client agree that a change of provider is desirable, the department should be notified of the transfer according to WAC 296-31-068.

(b) If an application for benefits has not been filed:

- (i) Provide instructions or help the client complete their portion of the application for benefits; and
- (ii) Include the name and address of the original provider, if known.

Note: Providers must determine if the client has public or private insurance benefits available. If there is, the provider should make sure they would be able to continue treating under the client's primary insurance. Crime victims compensation is secondary to other benefits according to RCW 7.68.130.

(6) You must notify us and the client of the date they are released to regular work. Time-loss compensation terminates on the release date. We may allow further treatment if:

- (a) You request it;
- (b) Treatment is needed; and
- (c) The accepted condition is not fixed and stable.

(7) You must notify us if permanent functional impairment or loss (permanent partial disability) is indicated after maximum recovery of the accepted condition is achieved. We will arrange to have impairments rated according to WAC 296-20-200 et al.

(8) A client must not be billed for treatment, except under the following condition:

A provider may require the client to pay for treatment if the client's eligibility is in question (e.g., when an investigation or claim determination is pending). If the claim is subsequently allowed, the provider must refund the client in full and bill us at their usual and customary fees if such rates are in excess of the public and private insurance entitlements.

(9) No fee is payable by the department for missed appointments unless the appointment is for an examination arranged by the department. Clients may be billed directly for missed or no show appointments.

[Statutory Authority: RCW 7.68.030, 7.68.060, 7.68.080. 00-03-056, § 296-31-070, filed 1/14/00, effective 2/14/00. Statutory Authority: RCW 7.68.030, 51.04.020(1) and 51.04.030. 95-15-004, § 296-31-070, filed 7/5/95, effective 8/5/95. Statutory Authority: RCW 43.22.050. 92-23-033, § 296-31-070, filed 11/13/92, effective 12/14/92.]

WAC 296-31-071 What records must providers maintain? If providers request payment from us for service, they must:

(1) Maintain all patient and billing records needed to:

- (a) Determine the extent of services provided to claimants or to their family members. Each record must, at a minimum:

(i) Document the level and type of service provided; and
 (ii) Where applicable, indicate the name of our representative who authorized equipment or treatment.

(b) Comply with our audit of services, if an audit is authorized.

(2) Maintain records for audit purposes for at least five years from the claimant's last treatment date.

(3) Provide records to us, if requested.

Note: The confidentiality (safeguarding and release) of a claimant's records is governed by RCW 7.68.140 and 7.68.145 of the Crime Victims Act.

[Statutory Authority: RCW 7.68.030, 51.04.020(4) and 51.04.030. 99-07-004, § 296-31-071, filed 3/4/99, effective 4/4/99. Statutory Authority: RCW 43.22.050. 92-23-033, § 296-31-071, filed 11/13/92, effective 12/14/92.]

WAC 296-31-072 Are provider records subject to a health care services review or an audit? (1) We may review or audit patient and related billing records to ensure:

(a) Claimants are receiving proper and necessary care; and

(b) You are complying with our mental health rules, fee schedules, and policies.

A records review can become the basis of corrective action against you.

(2) We may review your records:

(a) Before, during or after delivery of services;

(b) For cause or at random;

(c) Using statistical sampling methods and projections based on sample findings; and

(d) At or away from your place(s) of business.

(3) We must provide you with ten working days written notice that our auditors intend to review your patient and related billing records at your place(s) of business.

(4) We will not remove original records from your place of business, but we may request copies of your records. If copies are requested, they must be legible and provided to us within thirty calendar days of receiving our request.

[Statutory Authority: RCW 7.68.030, 51.04.020(4) and 51.04.030. 99-07-004, § 296-31-072, filed 3/4/99, effective 4/4/99. Statutory Authority: RCW 43.22.050. 92-23-033, § 296-31-072, filed 11/13/92, effective 12/14/92.]

WAC 296-31-073 Can the department enlist utilization review or management programs? As a trustee of funds appropriated by the legislature, we have a duty to supervise the provisions of proper and necessary mental health care. We may enlist utilization review or management programs to monitor and control the delivery, use, and cost of necessary mental health care services. Examples include, but are not limited to, managed care contracting, prior authorization of services, and alternative reimbursement systems.

[Statutory Authority: RCW 7.68.030, 51.04.020(4) and 51.04.030. 99-07-004, § 296-31-073, filed 3/4/99, effective 4/4/99. Statutory Authority: RCW 43.22.050. 92-23-033, § 296-31-073, filed 11/13/92, effective 12/14/92.]

WAC 296-31-074 What if my patient has an unrelated condition? (1) You must immediately notify us when you are treating an unrelated condition concurrently with an accepted condition and provide us with the following information:

(a) Diagnosis and/or nature of unrelated condition;

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(b) Treatment being provided; and

(c) The effect, if any, on the accepted condition.

(2) Temporary treatment of an unrelated condition may be allowed and payment for service authorized if:

(a) We approve your request for authorization prior to treatment;

(b) You give us a thorough explanation of how the unrelated condition is affecting the accepted condition;

(c) Treatment of the unrelated condition is retarding recovery of the accepted condition; and

(d) We receive monthly reports from you, outlining treatment and its effect on both the unrelated and accepted conditions.

(3) We will not approve or pay for treatment of:

(a) An unrelated condition that has no influence or no longer influences the existing condition.

(b) A preexisting unrelated condition that was treated prior to acceptance of the crime victim's claim, unless it is retarding recovery of the accepted condition.

[Statutory Authority: RCW 7.68.030. 00-03-056, § 296-31-074, filed 1/14/00, effective 2/14/00.]

WAC 296-31-075 What is excess recovery? The remaining balance of a recovery, which is paid to the victim but must be used to offset future payment of benefits.

How does excess effect the bill payment process?

(1) When an excess recovery exists, the department is not responsible for payment of bills.

(2) The provider must bill the department in accordance with the department's medical aid rules and maximum fee schedules.

(3) The department will:

(a) Determine the amount payable according to the fee schedule;

(b) Credit the excess recovery with the amount payable; and

(c) Send the provider a remittance advice showing the amount due from the victim.

(4) The victim must pay the provider in accordance with the remittance advice.

(5) When the excess is reduced to zero the department will resume responsibility for payment of bills.

[Statutory Authority: RCW 7.68.030, 7.68.050 and 7.68.130. 99-07-004, § 296-31-075, filed 3/4/99, effective 4/4/99. Statutory Authority: RCW 7.68.030, 51.04.020(1) and 51.04.030. 95-15-004, § 296-31-075, filed 7/5/95, effective 8/5/95. Statutory Authority: RCW 43.22.050. 92-23-033, § 296-31-075, filed 11/13/92, effective 12/14/92.]

WAC 296-31-080 How do providers bill for services?

(1) Neither the department nor the claimant is required to pay for provider services which violate the mental health treatment rules, fee schedule or department policy.

(2) All fees listed are the maximum fees allowable. Providers must bill their usual and customary fee for each service. If this is less than our fee schedule rate, you must bill us at the lesser rate. The department will pay the lesser of the billed charge or the fee schedule's maximum allowable.

The provider is prohibited from charging the claimant for any difference between the provider's charge and our allowable amount.

(3) Regardless of who completes the bill form, you are responsible for the completeness and accuracy of the description of services and of the charges billed.

(4) All bills submitted to the department must:

(a) Be itemized on forms approved by us.

For example: Physicians, psychologists, advanced registered nurse practitioners and master level mental health counselors may use our form or the national standard HCFA 1500 health insurance claim form. Hospitals use the UB 92 billing form for institution services and the national standard HCFA 1500 health insurance claim form for professional services.

(b) Refer to the crime victims compensation program mental health treatment rules and fees booklet for procedure code listings and detailed billing instructions. Billings must be submitted in accordance with this publication.

(5) The following supporting documentation must be maintained and, if applicable, submitted when billing for services:

- (a) Intake evaluation;
- (b) Progress reports;
- (c) Consultation reports;
- (d) Special or diagnostic study reports;
- (e) Independent assessment or closing exam reports;
- (f) BR (by report) describing why a service or procedure is too unusual, variable, or complex to be assigned a value unit;

(g) The claimant's or patient's (if patient is other than claimant) private or public insurance information;

For example: When services provided are for survivors of homicide victims.

(6) The claim number must appear in the appropriate field on each bill form. Reports and other correspondence must have the claim number in the upper right hand corner of each page.

(7) You may rebill us if your bill is not reported on your remittance advice within sixty days. Unless the information on the original bill was incorrect, a rebill should be identical. Rebills must be submitted for services denied if a claim is closed or rejected and subsequently reopened or allowed.

(8) We will adjust charges when appropriate. We must provide you with a written explanation as to why a billing was adjusted. A written explanation is not required if the adjustment was made solely to conform to our maximum allowable fees. Any inquiries regarding adjustment of charges must be received in the required format within ninety days from the date of payment.

[Statutory Authority: RCW 7.68.030, 7.68.080, 7.68.120, 51.36.010, 51.04.020 (1) and (4) and 51.04.030. 99-07-004, § 296-31-080, filed 3/4/99, effective 4/4/99; 97-02-090, § 296-31-080, filed 12/31/96, effective 1/31/97. Statutory Authority: RCW 7.68.030, 51.04.020(1) and 51.04.030. 95-15-004, § 296-31-080, filed 7/5/95, effective 8/5/95. Statutory Authority: Chapter 7.68 RCW. 94-02-015, § 296-31-080, filed 12/23/93, effective 1/24/94. Statutory Authority: RCW 43.22.050. 92-23-033, § 296-31-080, filed 11/13/92, effective 12/14/92.]

WAC 296-31-085 Can out-of-state providers bill the department? (1) Providers of mental health diagnostic and treatment services located outside the state of Washington:

(a) May bill us for services that we allow and are authorized by the crime victims compensation program mental health treatment rules;

(b) Must bill us according to the provisions of this chapter;

(c) Must bill their usual and customary fees; and

(d) Will be paid according to the Washington state crime victims compensation program mental health treatment rules and fees.

Exception: Hospitals located outside the state of Washington are paid according to WAC 296-30-081.

(2) Independent medical or mental health examinations must be billed and will be paid according to the examiner's usual and customary fee.

(3) We will not reimburse a charge for service(s) allowed under any out-of-state crime victims compensation program unless it is allowed in chapters 296-30 and 296-31 WAC. When in doubt, the provider should contact us to verify coverage.

[Statutory Authority: RCW 7.68.030, 7.68.080, 7.68.120, 51.36.010, 51.04.020 (1) and (4) and 51.04.030. 99-07-004, § 296-31-085, filed 3/4/99, effective 4/4/99.]

Chapter 296-32 WAC

SAFETY STANDARDS FOR TELECOMMUNICATIONS

WAC

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- 296-32-360 Tree trimming—Electrical hazards.
- 296-32-370 Buried facilities—Communications lines and power lines in the same trench.

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

- 296-32-001 Foreword—Effective date. [Foreword, effective 4/1/66.] Repealed by Order 77-12, filed 7/11/77.
- 296-32-010 Statements of fact—Construction of rules. [Rules (part), effective 4/1/66; Regulations 1.3, 1.4, 1.7, 1.8, 1.9, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
- 296-32-011 Procedure for settling controversy. [Rules (part), effective 4/1/66; Regulation 1.6, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
- 296-32-020 Causes of accident. [Rules (part), effective 4/1/66; Regulation 1.10, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
- 296-32-030 Causes of accident—Safety. [Rules (part), effective 4/1/66; Regulation 1.11, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
- 296-32-040 Definitions. [Definitions, effective 4/1/66; Regulations 1.12—1.25, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
- 296-32-050 Employer's responsibility. [Rules (part), effective 4/1/66; Regulations 2.1—2.11, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
- 296-32-060 Foreman's responsibility. [Rules (part), effective 4/1/66; Regulations 2.12—2.23, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.

296-32-070	Employee's responsibility. [Rules (part), effective 4/1/66; Regulations 2.24—2.31, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-080	First-aid. [Rules (part), effective 4/1/66; Regulations 3.1—3.4, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-090	Industrial hygiene. [Rules (part), effective 4/1/66; Regulations 3.5—3.7, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-094	Overhead work. [Rules (part), effective 4/1/66.] Repealed by Order 77-12, filed 7/11/77.
296-32-098	Molten solder handling. [Rules (part), effective 4/1/66.] Repealed by Order 77-12, filed 7/11/77.
296-32-100	Aerial plant. [§ VI, Rules 6.010—6.100, effective 4/1/66; Regulations 4.1—4.15, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-110	Underground plant. [§ VII, Rules 7.010—7.120, effective 4/1/66; Regulations 5.1—5.12, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-120	Central office plant. [§ IV, Rules 4.010—4.060, effective 4/1/66; Regulations 6.1—6.7, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-130	Tools and protective devices. [§ II, Rules 2.010—2.460, effective 4/1/66; Regulations 7.1—7.50, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-140	Motor vehicles, work equipment and transportation. [§ III, Rules 3.010—3.160, effective 4/1/66; Regulations 8.1—8.14, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-150	Power exposures. [§ VIII, Rules 8.010—8.200, effective 4/1/66; Regulations 9.1—9.20, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-160	General safety requirements. [§ I, Rules 1.010—1.120, effective 4/1/66; Rules 10.2—10.7, 10.10, 10.11, 10.14, 10.15, 10.16, 10.17, filed 3/23/60.] Repealed by Order 77-12, filed 7/11/77.
296-32-170	Manlift equipment. [§ V, Rules 5.010—5.090, effective 4/1/66.] Repealed by Order 77-12, filed 7/11/77.
296-32-180	Electronic communication equipment. [§ IX, Rules 9.010—9.120, effective 4/1/66.] Repealed by Order 77-12, filed 7/11/77.

WAC 296-32-200 Scope and application. (1) This chapter sets forth safety and health standards that apply to the work conditions, practices, means, methods, operations, installations and processes performed at telecommunications centers and at telecommunications field installations, which are located outdoors or in building spaces used for such field installations. "Center" work includes the installation, operation, maintenance, rearrangement, and removal of communications equipment and other associated equipment in telecommunications switching centers. "Field" work includes the installation, operation, maintenance, rearrangement, and removal of conductors and other equipment used for signal or communication service, and of their supporting or containing structures, overhead or underground, on public or private rights of way, including buildings or other structures.

(2) These standards do not apply:

(a) To construction work, as defined in chapter 296-155 WAC, nor

(b) To installations under the exclusive control of electric utilities used for the purpose of communications or metering, or for generation, control, transformation, transmission, and distribution of electric energy, which are located in buildings used exclusively by the electric utilities for such purposes, or located outdoors on property owned or leased by the electric utilities or on public highways, streets, roads, etc., or outdoors by established rights on private property.

(3) Operations or conditions not specifically covered by this chapter are subject to all the applicable standards contained in chapter 296-24 WAC, general safety and health standards. Operations which involve construction work, as

defined in chapter 296-155 WAC are subject to all the applicable standards contained in chapter 296-155 WAC, safety standards for construction work.

(4) This standard shall augment the Washington state general safety and health standards, general occupational health standards, electrical workers safety rules, and any other standards which are applicable to all industries governed by chapter 80, Laws of 1973, Washington Industrial Safety and Health Act. In the event of any conflict between any portion of this chapter and any portion of any of the general application standards, the provisions of this chapter 296-32 WAC, shall apply.

(5) In exceptional cases where compliance with specific provisions of this chapter can only be accomplished to the serious detriment and disadvantage of an operation, variance from the requirement may be permitted by the director of the department of labor and industries after receipt of application for variance which meets the requirements of WAC 296-24-010, general safety and health standards.

[Order 76-38, § 296-32-200, filed 12/30/76; Order 75-41, § 296-32-200, filed 12/19/75.]

WAC 296-32-210 Definitions. (1) The terms used in these standards shall be interpreted in the most commonly accepted sense consistent with the communications industry. The words "shall" and "must," are used to indicate the provisions which are mandatory.

(2) "Aerial lifts." Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to jobsites above ground:

- (a) Extensible boom platforms,
- (b) Aerial ladders,
- (c) Articulating boom platforms,
- (d) Vertical towers,

(e) A combination of any of the above defined in ANSI A92.2-1969. These devices are made of metal, wood, fiberglass, reinforced plastic (FRP), or other material; are powered or manually operated and are deemed to be aerial lifts whether or not they are capable of rotating about a substantially vertical axis.

(3) "Aerial splicing platform." This consists of a platform, approximately 3 feet x 4 feet, used to perform aerial cable work. It is furnished with fiber or synthetic ropes for supporting the platform from aerial strand, detachable guy ropes for anchoring it, and a device for raising and lowering it with a handline.

(4) "Aerial tent." A small tent usually constructed of vinyl coated canvas which is usually supported by light metal or plastic tubing. It is designed to protect employees in inclement weather while working on ladders, aerial splicing platforms, or aerial devices.

(5) "Alive or live (energized)." Electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of the earth in the vicinity. The term "live" is sometimes used in the place of the term "current-carrying," where the intent is clear, to avoid repetition of the longer term.

(6) "Barricade." A physical obstruction such as tapes, cones, or "A" frame type wood and/or metal structure intended to warn and limit access to a work area.

(7) "Barrier." A physical obstruction which is intended to prevent contact with energized lines or equipment, or to prevent unauthorized access to work area.

(8) "Bond." An electrical connection from one conductive element to another for the purpose of minimizing potential differences or providing suitable conductivity for fault current or for mitigation of leakage current and electrolytic action.

(9) "Cable." A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

(10) "Cable sheath." A protective covering applied to cables.

Note: A cable sheath may consist of multiple layers of which one or more is conductive.

(11) "Circuit." A conductor or system of conductors through which an electric current is intended to flow.

(12) "Clearance."

(a) The certification by the proper authority that a specified line or piece of equipment is de-energized; that the proper precautionary measures have been taken and that the line or equipment is being turned over to the workers.

(b) Separation or protection by the use of protective devices to prevent accidental contact by persons or objects on approach to a point of danger.

(13) "Climbing space." The vertical space reserved along the side of poles or structures to permit ready access for lineworkers to equipment and conductors located on poles or structures.

(14) "Communication lines." The conductors and their supporting or containing structures for telephone, telegraph, railroad signal, data, clock, fire, police-alarm, community television antenna and other systems which are used for public or private signal or communication service, and which operate at potentials not exceeding 400 volts to ground or 750 volts between any two points of the circuit, and the transmitted power of which does not exceed 150 watts. When communications lines operate at less than 150 volts to ground, no limit is placed on the capacity of the system. Specifically designed communications cables may include communication circuits not complying with the preceding limitations, where such circuits are also used incidentally to supply power to communication equipment.

(15) "Communication plant." The conductors and their associated equipment required to provide public or private signals or communicative service.

(16) "Competent or qualified person." A person who is familiar with the construction of, or operation of, such lines and/or equipment that concerns their position and who is fully aware of the hazards connected therewith OR one who has passed a journeyman's examination for the particular branch of the trades with which they may be connected. In case of dispute, competency shall be established by a committee appointed by the director or assistant director of the department of labor and industries consisting of representatives of all interested parties.

(17) "Conductor." A material, usually in the form of a wire, cable, or bus bar, suitable for carrying an electric current.

(18) "Effectively grounded." Intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the build-up of voltages which may result in undue hazard to connected equipment or to persons.

(19) "Emergency." When an unusual condition exists that endangers life and/or property.

(20) "Energized." Electrically connected to a source of potential difference or electrically charged so as to have a potential different from that of the earth or different from that of adjacent conductors or equipment. For the purpose of these rules, potential differences less than 100 volts shall not apply. This definition does not include communication lines of less than 300 volts.

(21) "Equipment." A general term which includes materials, fittings, devices, appliances, fixtures, apparatus, and similar items used as part of, or in connection with, a supply or communications installation.

(22) "Crewleader or person-in-charge." That person directly in charge of workers doing the work regardless of title.

(23) "Ground (reference)." That conductive body usually earth, to which an electric potential is referenced.

(24) "Ground (as a noun)." A conductive connection, whether intentional or accidental, by which an electric circuit or equipment is connected to reference ground.

(25) "Ground (as a verb)." The connecting or establishment of a connection, whether by intention or accident, of an electric circuit or equipment to reference ground.

(26) "Grounding." The act of placing shorts and grounds on conductors and equipment for the purpose of protecting workers from dangerous voltages while working on such lines or equipment.

(27) "Ground tent." A small tent usually constructed of vinyl coated canvas supported by a metal or plastic frame. Its purpose is to protect employees from inclement weather while working at buried cable pedestal sites or similar locations.

(28) "Grounded conductor." A system or circuit conductor which is intentionally grounded.

(29) "Grounded systems." A system of conductors in which at least one conductor or point (usually the middle wire, or the neutral point of transformer or generator windings) is intentionally grounded, either solidly or through a current-limiting device (not a current-interrupting device).

(30) "Grounding electrode conductor (grounding conductor)." A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode.

(31) "Guard or guarded." Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, screens, mats, platforms, or warning signs or devices to remove the possibility of dangerous contact on approach by other persons or objects to a point of danger.

(32) "Insulated." Separated from other conducting surfaces by a dielectric substance (including air space) offering a high resistance to the passage of current.

Note: When any object is said to be insulated, it is understood to be insulated in suitable manner for the conditions to which it is subjected. Otherwise, it is, within the purpose of these standards, uninsulated. Insulating coverings of conductors is one means of making the conductor insulated.

(33) "Insulation (as applied to cable)." That which is relied upon to insulate the conductor from other conductors or conducting parts or from ground.

(34) "Joint use." The sharing of a common facility, such as a manhole, trench or pole, by two or more different kinds of utilities, (e.g., power and telecommunications).

(35) "Ladder platform." A device designed to facilitate working aloft from an extension ladder. A typical device consists of a platform (approximately 9" x 18") hinged to a welded pipe frame. The rear edge of the platform and the bottom crossmember of the frame are equipped with latches to lock the platform to ladder rungs.

(36) "Ladder seat." A removable seat used to facilitate work at an elevated position on rolling ladders in telecommunication centers.

(37) "Manhole." A subsurface enclosure which personnel may enter and which is used for the purpose of installing, operating, and maintaining submersible equipment and/or cable.

(38) "Manhole platform." A platform consisting of separate planks which are laid across steel platform supports. The ends of the supports are engaged in the manhole cable racks.

(39) "Manlift equipment." Such types of portable truck-mounted equipment as mechanical, electric or hydraulic ladders and boom-mounted buckets or cages.

(40) "Microwave transmission." The act of communicating or signaling utilizing a frequency between 1 GHz_z (gigahertz) and 300 GHz_z inclusively.

(41) "Nominal voltage." The nominal voltage of a system or circuit is the value assigned to a system or circuit of a given voltage class for the purpose of convenient designation. The actual voltage may vary above or below this value.

(42) "Pole balcony or seat." A balcony or seat used as a support for workers at pole-mounted equipment or terminal boxes. A typical device consists of a bolted assembly of steel details and a wooden platform. Steel braces run from the pole to the underside of the balcony. A guard rail (approximately 30" high) may be provided.

(43) "Pole platform." A platform intended for use by a worker in splicing and maintenance operations in an elevated position adjacent to a pole. It consists of a platform equipped at one end with a hinged chain binder for securing the platform to a pole. A brace from the pole to the underside of the platform is also provided.

(44) "Protection from hazardous voltage." The isolation from or de-energizing of equipment to prevent accidental contact by persons or objects on approach to point of danger.

(45) "Protective devices." Those devices such as rubber gloves, rubber blankets, line hose, rubber hoods or other insulating devices, which are specially designed for the protection of workers.

(46) "Public highway." Every way, land, road, street, boulevard, and every way or place in the state open as matter

of right to public vehicular travel, both inside and outside the limit of cities and towns.

(47) "Qualified employee." Any worker who by reason of their training and experience has demonstrated an ability to safely perform their duties.

(48) "Qualified line-clearance tree trimmer." A tree worker who through related training and on-the-job experience is familiar with the special techniques and hazards involved in line clearance.

(49) "Qualified line-clearance tree-trimmer trainee." Any worker regularly assigned to a line-clearance tree-trimming crew and undergoing on-the-job training who, in the course of such training, has demonstrated their ability to perform duties safely at their level of training.

(50) "Sheath." As applied to sharp tools that effectively covers the tool.

(51) "System operator/owner." The person or organization that operates or controls the electrical conductors involved.

(52) "Telecommunications center." An installation of communication equipment under the exclusive control of an organization providing telecommunications service, that is located outdoors or in a vault, chamber, or a building space used primarily for such installations.

Note: Telecommunication centers are facilities established, equipped and arranged in accordance with engineered plans for the purpose of providing telecommunications service. They may be located on premises owned or leased by the organization providing telecommunication service, or on the premises owned or leased by others. This definition includes switch rooms (whether electromechanical, electronic, or computer controlled), terminal rooms, power rooms, repeater rooms, transmitter and receiver rooms, switchboard operating rooms, cable vaults, and miscellaneous communications equipment rooms. Simulation rooms of telecommunication centers for training or developmental purposes are also included.

(53) "Telecommunications derricks." Rotating or nonrotating derrick structures permanently mounted on vehicles for the purpose of lifting, lowering, or positioning hardware and materials used in telecommunications work.

(54) "Telecommunication line truck." A truck used to transport workers, tools, and material, and to serve as a traveling workshop for telecommunication installation and maintenance work. It is sometimes equipped with a boom and auxiliary equipment for setting poles, digging holes, and elevating material or workers.

(55) "Telecommunication service." The furnishing of a capability to signal or communicate at a distance by means such as telephone, telegraph, police and fire-alarm, community antenna television, or similar system, using wire, conventional cable, coaxial cable, wave guides, microwave transmission, or other similar means.

(56) "Unvented vault." An enclosed vault in which the only openings are access openings.

(57) "Vault." An enclosure above or below ground which personnel may enter, and which is used for the purpose of installing, operating, and/or maintaining equipment and/or cable which need not be of submersible design.

(58) "Vented vault." An enclosure as described in subsection (57) of this section, with provision for air changes using exhaust flue stack(s) and low level air intake(s), operat-

ing on differentials of pressure and temperature providing for air flow.

(59) "Voltage communications." Voltage used for electronic communications equipment to which workers or protective equipment may be subjected.

(a) *High* means over 600 volts to ground—RMS AC or DC or over 1,000 volts RMS across bare parts.

(b) *Medium high* means 151 to 600 volts to ground—RMS AC or DC or 301 to 1,000 volts RMS AC across any bare parts.

(60) "Voltage electric supply." The maximum effective line voltage to which the workers or protective equipment may be subjected.

(a) *Low* includes voltages from 100 to 750 volts.

(b) *High* means those voltages in excess of 750 volts.

(61) "Voltage of an effectively grounded circuit." The voltage between any conductor and ground unless otherwise indicated.

(62) "Voltage of a circuit not effectively grounded." The voltage between any two conductors. If one circuit is directly connected to and supplied from another circuit of higher voltage (as in the case of an autotransformer), both are considered as of the higher voltage, unless the circuit of lower voltage is effectively grounded, in which case its voltage is not determined by the circuit of higher voltage. Direct connection implies electric connection as distinguished from connection merely through electromagnetic or electrostatic induction.

[Statutory Authority: Chapter 49.17 RCW, 94-15-096 (Order 94-07), § 296-32-210, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-210, filed 12/30/76; Order 75-41, § 296-32-210, filed 12/19/75.]

WAC 296-32-215 Safe place standard. (1) No employer shall require any employee to go or be in any employment or place of employment which is not safe.

(2) No employer shall fail or neglect:

(a) Provide safe access to the work site.

(b) To provide and use safety devices and safeguards.

(c) To adopt and use methods and processes to render the employment and place of employment safe.

(d) To do every other thing reasonably necessary to protect the life and safety of employees.

[Order 76-38, § 296-32-215, filed 12/30/76.]

WAC 296-32-220 General. (1) Buildings containing telecommunications centers.

(a) **Illumination.** Lighting in telecommunication centers shall be provided in an amount such that continuing work operations, routine observations, and the passage of employees can be carried out in a safe and healthful manner.

(b) Specific tasks in centers, such as splicing cable and the maintenance and repair of equipment frame lineups, the employer shall install permanent lighting or portable supplemental lighting to attain a higher level of illumination.

(c) Refer to WAC 296-62-09003 (general occupational health standards) which shall apply as minimum standards of illumination for industrial interiors.

(d) **Illumination of field work.** Whenever natural light is insufficient to illuminate the worksite, artificial illumination shall be provided to enable the employee to perform the work safely.

(2001 Ed.)

(2) Working surfaces.

(a) Working surfaces shall be in conformance with the latest edition of the general safety and health standard WAC 296-24-735 through 296-24-76523.

(b) Guard rails and toe boards may be omitted on distribution frame mezzanine platforms to permit access to equipment. This exemption applies only on the side or sides of the platform facing the frames and only on those portions of the platform adjacent to equipped frames.

(3) Working spaces.

(a) Space shall be provided for access to all medium high and high voltage equipment.

(b) Every structure, new or old, designed for human occupancy shall be provided with exits to permit the prompt escape of occupants in case of fire or other emergency. The means of egress shall be a continuous and unobstructed way of exit travel from any point in a building or structure to a public way and consist of three separate and distinct parts; the way of exit access, the exit and the way of exit discharge. A means of egress comprises the vertical and horizontal ways of travel and shall include intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts and yards.

(c) "Maintenance aisles," or "wiring aisles," between equipment frame lineups are working spaces and are not a means of egress for purposes of WAC 296-24-550.

(4) Special doors.

(a) When blastproof or power actuated doors are installed in specially designed hardsite security buildings and spaces, they shall be designed and installed so that they can be used as a means of egress in emergencies.

(b) When high voltage apparatus is isolated in a supplementary enclosure, interlocks shall be provided on all access doors. Warning signs shall be provided, which are visible both when the guard or cover is in place or removed.

(5) Equipment, machinery and machine guarding.

(a) When power plant machinery in telecommunications centers is operated with commutators and couplings uncovered, the adjacent housing shall be clearly marked to alert personnel to the rotating machinery.

(b) All power switches on power panels shall be in an open position when they are not controlling an operating circuit. Before opening any power circuit, the load shall be reduced. "Men working" signs, or similar wording shall be placed on switches associated with motors or generators under repair.

(c) When working on the brushes of a machine in operation, employees shall use care not to break a circuit. When it is necessary to remove a brush from the holder, the machine shall be shut down.

(d) Only fuse pullers specifically designed for that purpose shall be used when replacing cartridge type fuses.

(6) Battery handling.

(a) Eye protection devices which provide side as well as frontal eye protection for employees shall be provided when measuring storage battery specific gravity or handling electrolyte, and the employer shall ensure that such devices are used by the employees.

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(b) The employer shall also ensure that acid resistant gloves and aprons shall be worn for protection against spattering.

(c) Facilities for quick drenching or flushing of the eyes and body shall be provided unless the storage batteries are of the enclosed type and equipped with explosion proof vents, in which case sealed water rinse or neutralizing packs may be substituted for the quick drenching or flushing facilities.

(d) Employees assigned to work with storage batteries shall be instructed in emergency procedures such as dealing with accidental acid spills.

(e) Electrolyte (acid or base, and distilled water) for battery cells shall be mixed in a well ventilated room. Acid or base shall be poured gradually, while stirring, into the water. Water shall never be poured into concentrated (greater than 75 percent) acid solutions. Electrolyte shall never be placed in metal containers nor stirred with metal objects.

(f) When taking specific gravity readings, the open end of the hydrometer shall be covered with an acid resistant material while moving it from cell to cell to avoid splashing or throwing the electrolyte.

(g) Ventilation, shall be provided to ensure diffusion of the gasses from the battery to prevent the accumulation of an explosive type mixture.

(h) Racks and trays shall be substantial and treated to be resistant to the electrolyte.

(i) Floors shall be of acid resistant construction or be protected from acid accumulation.

(7) Hazardous materials.

(a) Highway mobile vehicles and trailers stored in garages in accordance with WAC 296-24-47513 (4)(b) may be equipped to carry more than one LP-gas container, but the total capacity of LP-gas containers per work vehicle stored in garages shall not exceed 100 pounds of LP-gas.

(b) All container valves shall be closed when not in use.

(8) Compressed gas.

(a) When using or transporting nitrogen cylinders, special compartments, racks, or blocking shall be provided to prevent cylinder movement.

(b) Regulators shall be removed or guarded before a cylinder is transported.

(9) Support structures.

(a) No employee, or any material or equipment, shall be supported or permitted to be supported on any portion of a pole structure, platform, ladder, walkway or other elevated structure or aerial device unless the employer ensures that the support structure is first inspected by a competent person and it is determined to be strong, in good working condition and properly secured in place.

(b) Workers shall not throw anything from pole to ground, from pole to pole or from ground to pole.

(10) Power exposures.

(a) The employer shall ensure that no employee approaches or takes any conductive object closer to any electrically energized overhead power lines and parts than prescribed in Table 1 unless:

(i) The employee is insulated or guarded from the energized parts (insulating gloves rated for the voltage involved shall be considered adequate insulation), or

(ii) The energized parts are insulated or guarded from the employee and any other conductive object at a different potential, or

(iii) The power conductors and equipment are deenergized and grounded.

(b) While handling communication wires, metal sheaths, or communication equipment, contact shall be avoided with street lamp brackets, trolley span wires, power guys, transformer cases and any other power equipment that may be energized. The safest possible working position shall be assumed before starting work.

(c) Communication employees shall never work in the pole space on jointly used poles between normal primary and secondary attachments.

(d) Where a hazard of a power contact exists, due to use of long handled tools, proper rubber equipment shall be used.

TABLE 1

APPROACH DISTANCES TO EXPOSED ENERGIZED OVERHEAD POWER LINES AND PARTS

Voltage Range (phase to phase, RMS)	Approach Distance (inches)
300 V and less	(1)
Over 300 V, not over 750 V	12
Over 750 V not over 2 kV	18
Over 2 kV, not over 15 kV	24
Over 15 kV, not over 37 kV	36
Over 37 kV, not over 87.5 kV	42
Over 87.5 kV, not over 121 kV	48
Over 121 kV, not over 140 kV	54

(1) Avoid contact.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-32-220, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-220, filed 12/30/76; Order 75-41, § 296-32-220, filed 12/19/75.]

WAC 296-32-230 Training. (1) Employers shall provide training in the various precautions and safe practices described in this section and shall insure that employees do not engage in the activities to which this chapter applies until such employees have received proper training in the various precautions and safe practices required by this section. However, where the employer can demonstrate that an employee is already trained in the precautions and safe practices required by this section prior to their employment, training need not be provided to that employee in accordance with this section.

(2) Where training is required, it shall consist of on-the-job training or classroom-type training or a combination of both.

(3) The training program shall include a list of the subject courses and the types of personnel required to receive such instruction. A written description of the training program and a record of employees who have received such training shall be maintained for the duration of the employee's employment and shall be made available upon request to the director of the department of labor and industries, or his/her authorized representative.

(4) Such training shall, where appropriate, include the following subjects:

(a) Recognition and avoidance of dangers relating to encounters with harmful substances, and animal, insect, or plant life.

(b) Procedures to be followed in emergency situations, and

(c) First aid training, including instruction in artificial respiration.

(5) It shall be the responsibility of the employer to hold monthly safety meetings at practical points throughout the operation and insist upon employees attending said meetings. Minutes shall be kept of each safety meeting and retained for a period of one year.

(6) It shall be the responsibility of management to develop and maintain a hazard communication program as required by chapter 296-62 WAC, Part C which will provide information to all employees relative to hazardous chemicals or substances to which they are exposed, or may become exposed, in the course of their employment.

[Statutory Authority: Chapter 49.17 RCW, 94-15-096 (Order 94-07), § 296-32-230, filed 7/20/94, effective 9/20/94; 89-11-035 (Order 89-03), § 296-32-230, filed 5/15/89, effective 6/30/89; Order 76-38, § 296-32-230, filed 12/30/76; Order 75-41, § 296-32-230, filed 12/19/75.]

WAC 296-32-240 Employee protection in public work areas. (1)(a) Before work is begun in the vicinity of vehicular or pedestrian traffic which may endanger employees, warning signs and/or flags or other traffic control devices shall be placed conspicuously to alert and channel approaching traffic. Where further protection is needed, barriers shall be utilized.

(b) At night, warning lights shall be prominently displayed, and excavated areas shall be enclosed with protective barricades.

(2) When work exposes energized or moving parts that are normally protected, danger signs shall be displayed and barricades erected to warn other personnel in the area.

(3) The employer shall insure that an employee finding any crossed or fallen wires which create or may create a hazardous situation at the work area:

(a) Remains on guard or adopts other adequate means to warn other employees of the danger, and

(b) Has the proper authority notified at the earliest practical moment.

[Order 76-38, § 296-32-240, filed 12/30/76; Order 75-41, § 296-32-240, filed 12/19/75.]

WAC 296-32-250 Tools and personal protective equipment—General. (1) Personal protective equipment, protective devices and special tools needed for the work of employees shall be provided and the employer shall ensure that they are used by employees.

(a) Before each day's use the employer shall ensure that these personal protective devices, tools, and equipment are carefully inspected by a competent person to ascertain that they are in good condition.

(b) Tools found to be defective shall be taken out of service.

(2) Head protection. Class B protective helmets shall be provided whenever there is exposure to overhead hazards and/or possible high voltage electrical contact.

(a) Employees working in areas where there is a possible danger of head injury from impact, falling or flying objects, shall be protected by protective helmets.

(b) Criteria for protective helmets.

(i) Protective helmets purchased after February 20, 1995, shall comply with ANSI Z89.1-1986, "American National Standard for Personnel Protection—Protective Headwear for Industrial Workers—Requirements," which is incorporated by reference, or shall be demonstrated to be equally effective.

(ii) Protective helmets purchased before February 20, 1995, shall comply with the ANSI standard "American National Standard Safety Requirements for Industrial Head Protection," ANSI Z89.1-1969, or shall be demonstrated by the employer to be equally effective.

(3) Eye protection. Protective eye and face equipment shall be required where there is a possibility of injury that can be prevented by such equipment. In such cases, employers shall make conveniently available a type of protector suitable for the work to be performed, and employees shall use such protectors.

Note: See chapter 296-24 WAC, Part A-2, for additional personal protective equipment requirements.

(4) Tent heaters, torches and open flame. Open flames shall not be used within ground tents or on platforms within aerial tents unless:

(a) The tent covers are constructed of fire resistant materials, and

(b) Ventilation is provided to maintain safe oxygen levels and avoid harmful buildup of combustion products and combustible gases.

(5) Portable power equipment.

(a) All portable power equipment used in the telecommunications industry shall be grounded.

(b) Nominal 120V, or less, portable generators used for providing power at work locations do not require grounding if the output circuit is completely isolated from the frame of the unit.

(c) Grounding shall be omitted when using soldering irons, guns or wire-wrap tools on telecommunication circuits.

(6) Vehicle-mounted utility generators. Vehicle-mounted utility generators used for providing nominal 240V AC or less for powering portable tools and equipment need not be grounded to earth if all of the following conditions are met:

(a) One side of the voltage source is solidly strapped to the metallic structure of the vehicle;

(b) Grounding-type outlets are used, with a "grounding" conductor between the outlet grounding terminal and the side of the voltage source that is strapped to the vehicle;

(c) All metallic encased tools and equipment that are powered from this system are equipped with three-wire cords and grounding-type attachment plugs, except as designated in subsection (7) of this section.

(7) Portable lights, tools and appliances. When operated from commercial power such metal parts of these devices shall be grounded, unless these tools or appliances are protected by a system of double insulation, or its equivalent. Where such a system is employed, the equipment shall be distinctively marked to indicate double insulation.

(8) Lead work. When operated from commercial power the metal housing of electric solder pots shall be grounded. Electric solder pots may be used with the power equipment described in this subsection, without a grounding conductor.

The employer shall ensure that wiping gloves or cloths and eye protection are used in lead wiping operations. A drip pan to catch hot lead drippings shall also be provided and used.

(9) Fire extinguishers.

(a) Fire extinguishers shall be provided for the protection of both the building structure and the occupancy hazards contained therein.

(b) Employees shall be familiar with the location and operation of fire extinguishers.

(c) Any fire extinguishers showing defects shall be removed from service.

(d) Fire extinguishers shall be thoroughly examined and/or recharged or repaired to insure operability and safety once every year.

(e) Each fire extinguisher shall have a durable tag securely attached to show the maintenance or recharge date and the initials or signature of the person performing this service.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-32-250, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-13-045 (Order 82-22), § 296-32-250, filed 6/11/82; Order 76-38, § 296-32-250, filed 12/30/76; Order 75-41, § 296-32-250, filed 12/19/75.]

WAC 296-32-260 Rubber insulating equipment. (1)

Rubber insulating equipment designed for the voltage levels to be encountered shall be provided and the employer shall ensure that they are used by employees as required by this section. The requirements of WAC 296-24-092, Electrical protective equipment, shall be followed except for Table A-6.

(2) The employer is responsible for periodic retesting of all insulating gloves, blankets, and other rubber insulating equipment. This retesting shall be electrical, visual and mechanical. The following maximum retesting intervals shall apply:

Gloves, Blankets, and Other Insulating Equipment	Natural Rubber (Months)	Synthetic Rubber (Months)
New	12	18
Reissued	9	15

(3) Protector for gloves. Approved protectors must be worn at all times over rubber gloves. Inner liners may be worn if desired.

(4) Gloves and blankets shall be marked to indicate compliance with the retest schedule and shall be marked with the date the next test date is due.

Any rubber gloves found to be defective shall be removed from service and marked as being defective.

(5) Patching rubber goods is prohibited; rubber protective equipment shall not be vulcanized or patched.

(6) Rubber gloves for workers. A pair of rubber gloves, specifically designed for the protection of workers, shall be assigned each worker when required to work on or be exposed to energized parts.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-32-260, filed 8/17/99, effective 12/1/99; Order 76-38, § 296-32-260, filed 12/30/76; Order 75-41, § 296-32-260, filed 12/19/75.]

WAC 296-32-270 Personal climbing equipment. (1)

General. Safety belts and straps shall be provided and the employer shall ensure their use when work is performed at positions more than 4 feet above ground, on poles, and on towers, except as provided in WAC 296-32-340 (7)(8) of this chapter. No safety belts, safety straps or lanyards acquired after January 1, 1976, may be used unless they meet the tests set forth in chapter 296-45 WAC. The employer shall ensure that all safety belts and straps are inspected by a competent person prior to each day's use to determine that they are in safe working condition.

(2) Telecommunication lineman's body belts, safety straps and lanyards, general requirements. Hardware for lineman's body belts, safety straps and lanyards shall be drop forged or pressed steel and shall have a corrosion resistant finish tested to meet the requirements of the American Society for Testing and Materials B117-64 (50-hour test).

EXCEPTION: Lineman's body belts shall be at least four inches in width.

(3) Pole climbers.

(a) Pole climbers may not be used if the gaffs are less than 1-1/4 inches in length as measured on the underside of the gaff.

(b) The gaffs of pole climbers shall be covered with safety caps when not being used for their intended use.

(c) The employer shall ensure that pole climbers are inspected by a competent person for the following conditions: Fractured or cracked gaffs or leg irons, loose or dull gaffs, broken straps or buckles. If any of these conditions exist, the defect shall be corrected before the climbers are used.

(d) Pole climbers shall be inspected as required in this subsection before each day's use and a gaff cut-out test performed at least weekly when in use.

(e) Pole climbers shall not be worn when:

(i) Working in trees (specifically designed tree climbers shall be used for tree climbing),

(ii) Working on ladders,

(iii) Working in an aerial lift,

(iv) Driving a vehicle,

(v) Walking on rocky, hard, frozen, brushy or hilly terrain.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-32-270, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-270, filed 12/30/76; Order 75-41, § 296-32-270, filed 12/19/75.]

WAC 296-32-280 Ladders. (1)

The employer shall ensure that no employee nor any material or equipment shall be supported or permitted to be supported on any portion of a ladder unless it is first determined, by inspections and checks conducted by a competent person that such ladder is free of defects, in good condition and secured in place.

(2) The spacing between steps or rungs permanently installed on poles and towers shall be no more than 18 inches (36 inches on any one side). This requirement also applies to fixed ladders on towers, when towers are so equipped. Spac-

ing between steps shall be uniform above the initial unstepped section, except where working, standing, or access steps are required. Fixed ladder rungs and step rungs for poles and towers shall have a minimum diameter of 5/8 inch. Fixed ladder rungs shall have a minimum clear width of 12 inches. Steps for poles and towers shall have a minimum clear width of 4-1/2 inches. The spacing between detachable steps may not exceed 30 inches on any one side, and these steps shall be secured when in use.

(3) After October 31, 1975, portable wood ladders intended for general use shall not be painted but may be coated with a translucent nonconductive coating. Portable wood ladders shall not be longitudinally reinforced with metal.

(4) Portable wood ladders that are not being carried on vehicles and are not in active use shall be stored where they will not be exposed to the elements and where there is good ventilation.

(5) Rolling ladders.

(a) Rolling ladders used in telecommunication centers shall have a width between the side rails, inside to inside, of at least 12 inches.

(b) Except in working spaces that are not a means of egress, the ladders shall have a minimum inside width, between the side rails, of at least eight inches.

(6) Climbing ladders or stairways on scaffolds used for access and egress shall be affixed or built into the scaffold by proper design and engineering, and shall be so located that their use will not disturb the stability of the scaffold. The rungs of the climbing device shall be equally spaced, but may not be less than 12 inches nominal nor more than 16 inches nominal apart. Horizontal end rungs used for platform support may also be utilized as a climbing device if such rungs meet the spacing requirement of this subsection, and if clearance between the rung and the edge of the platform is sufficient to afford a secure handhold. If a portable ladder is affixed to the scaffold, it shall be securely attached and shall have rungs meeting the spacing requirements of this subsection. Clearance shall be provided in the back of the ladder of not less than 6 inches from center of rung to the nearest scaffold structural member.

(7) When a ladder is supported by an aerial strand, and ladder hooks or other supports are not being used, the ladder shall be extended at least 2 feet above the strand and shall be secured to it (e.g. lashed or held by a safety strap around the strand and ladder side rail). When a ladder is supported by a pole, it shall be securely lashed to the pole unless the ladder is specifically designed to prevent movement when used in this application.

(8) Portable wood straight ladders, when in use, shall be equipped with safety shoes.

(9) Ladders shall be inspected by a competent person prior to each use. Ladders which have developed defects shall be withdrawn from service for repair or destruction and tagged or marked as "dangerous do not use."

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-32-280, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-280, filed 12/30/76; Order 75-41, § 296-32-280, filed 12/19/75.]

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WAC 296-32-290 Vehicle-mounted material handling devices and other mechanical equipment. (1) General.

(a) The employer shall ensure that visual inspections are made of the equipment by a competent person each day the equipment is to be used to ascertain that it is in good condition.

(b) The employer shall ensure that tests shall be made at the beginning of each shift by a competent person to insure the vehicle brakes and operating systems are in proper working condition.

(2) Scrapers, loaders, dozers, graders and tractors.

All mobile, self-propelled scrapers, mobile front end loaders, mobile dozers, agricultural and industrial tractors, crawler tractors, crawler-type loaders, and motor graders, with or without attachments, that are used in telecommunications work shall have rollover protective structures that meet the requirements of WAC 296-155-950 through 296-155-965.

(3) Aerial manlift equipment.

(a) These devices shall not be operated with any conductive part of the equipment closer to exposed energized power lines than the clearances set forth in Table 1 of this chapter.

(b) Only qualified drivers shall be permitted to operate aerial manlift equipment and shall possess a current motor vehicle operator's license.

(c) When performing work from aerial manlift equipment, the worker shall wear a safety belt attached to the boom.

(d) When any aerial manlift equipment is parked at the jobsite, the brakes shall be set. Wheel chocks shall be used to prevent uncontrolled movement. If equipped with outriggers, the outriggers shall be implanted on firm footing.

(e) Manufacturer's recommended maximum load limit shall be posted near each set of controls, kept in legible condition and the maximum load limit shall not be exceeded.

(f) Flashing warning lights shall be installed and maintained on all aerial manlift equipment used on public thoroughfares.

(4)(a) The operation of all motor vehicles and trailers shall be in conformance with the motor vehicle laws, the general safety and health standards of the state of Washington and all local traffic ordinances.

(b) When it is necessary for the worker to work in the bucket at an elevated position with the vehicle in motion, there shall be direct communication between the worker and the vehicle operator.

(5) Derrick trucks and similar equipment.

(a) This equipment shall not be operated with any conductive part of the equipment closer to exposed energized power lines than the clearances set forth in Table 1 of this chapter.

(b) When derricks are used to handle poles near energized power conductors, these operations shall comply with the requirements contained in WAC 296-32-220(10) and 296-32-330(11) of this chapter.

(c) Moving parts of equipment and machinery carried on or mounted on telecommunications line trucks shall be guarded. This may be done with barricades as specified in WAC 296-32-240(2) of this chapter.

(d) Derricks and the operation of derricks shall comply with the following requirements:

(i) Manufacturer's specifications, load ratings and instructions for derrick operation shall be strictly observed.

(ii) Rated load capacities and instructions related to derrick operation shall be conspicuously posted on a permanent weather-resistant plate or decal in a location on the derrick that is plainly visible to the derrick operator.

(iii) Prior to derrick operation the parking brake must be set and the stabilizers extended if the vehicle is so equipped. When the vehicle is situated on a grade, at least two wheels must be chocked on the downgrade side.

(iv) Only persons trained in the operation of the derrick shall be permitted to operate the derrick.

(v) Hand signals to derrick operators shall be those prescribed by ANSI B30.6-1969, "Safety Code for Derricks."

(vi) The employer shall ensure that the derrick and its associated equipment are inspected by a competent person at intervals set by the manufacturer but in no case less than once per year. Records shall be maintained including the dates of inspections, and necessary repairs made.

(vii) Modifications or additions to the derrick and its associated equipment that alter its capacity or affect its safe operation shall be made only with written certification from the manufacturer, or other equivalent entity, such as a nationally recognized testing laboratory, that the modification results in the equipment being safe for its intended use. Such changes shall require the changing and posting of revised capacity and instruction decals or plates. These new ratings or limitations shall be as provided by the manufacturer or other equivalent entity.

(viii) Wire rope used with derricks shall be of improved plow steel or equivalent. Wire rope safety factors shall be in accordance with American National Standards Institute B30.6-1969.

(ix) Wire rope shall be taken out of service, or the defective portion removed, when any of the following conditions exist:

(A) The rope strength has been significantly reduced due to corrosion, pitting, or excessive heat, or

(B) The thickness of the outer wires of the rope has been reduced to two-thirds or less of the original thickness, or

(C) There are more than six broken wires in any one rope lay, or

(D) There is excessive permanent distortion caused by kinking, crushing, or severe twisting of the rope.

[Statutory Authority: Chapter 49.17 RCW, 94-15-096 (Order 94-07), § 296-32-290, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-290, filed 12/30/76; Order 75-41, § 296-32-290, filed 12/19/75.]

WAC 296-32-300 Materials handling and storage. (1) Poles.

(a) When working with poles in piles or stacks, work shall be performed from the ends of the poles and precautions shall be taken for the safety of employees at the other end of the pole.

(b) During pole hauling operations, all loads shall be secured to prevent displacement. Lights, reflectors and/or flags shall be displayed on the end and sides of the load.

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(c) The requirements for installation, removal, or other handling of poles in pole lines are prescribed in WAC 296-32-330 which pertains to overhead lines.

(d) In the case of hoisting machinery equipped with a positive stop load-holding device, it shall be permissible for the operator to leave their position at the controls (while a load is suspended) for the sole purpose of assisting in positioning the load prior to landing it.

(e) Prior to unloading steel, poles, crossarms, and similar material, the load shall be thoroughly examined to ascertain that the load has not shifted, that binders or stakes have not broken, and that the load is not otherwise hazardous to employees.

(2) Cable reels. Cable reels and poles in storage shall be checked or otherwise restrained to prevent uncontrollable movement.

(3) All tools and materials shall be stored in a safe and orderly manner.

(4) Workers shall not carry loose materials, tools, or equipment on or in vehicles in a manner that would constitute a hazard.

(5) All buildings, storage yards, equipment and other property shall be kept in a clean and orderly manner.

[Statutory Authority: Chapter 49.17 RCW, 94-15-096 (Order 94-07), § 296-32-300, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-300, filed 12/30/76; Order 75-41, § 296-32-300, filed 12/19/75.]

WAC 296-32-310 Cable fault locating and testing. (1) Employees involved in using high voltages to locate trouble or test cables shall be instructed in the precautions necessary for their own safety and the safety of other employees.

(2) Before voltage is applied to equipment not isolated, all possible precautions shall be taken to insure that no employee can make contact with the energized conductors under test.

(3) Only trained and authorized personnel shall repair and test medium and high voltage equipment.

[Order 76-38, § 296-32-310, filed 12/30/76; Order 75-41, § 296-32-310, filed 12/19/75.]

WAC 296-32-320 Grounding for employee protection—Pole lines. (1) Power conductors. Electric power conductors and equipment shall be considered as energized until the employee can determine that they are bonded to one of the grounds as listed in subsection (4) of this section.

(2) Nonworking open wire. Nonworking open wire communications lines shall be bonded to one of the grounds listed in subsection (4) of this section.

(3) Vertical power conduit, power ground wires and street light fixtures.

(a) Metal power conduit on joint use poles, exposed vertical power ground wires, and street light fixtures which are below communications attachments or less than 20 inches above these attachments, shall be considered energized and shall be tested for voltage unless the employee can visually determine that they are bonded to the communications suspension strand or cable sheath.

(b) If no hazardous voltage is shown by the voltage test, a temporary bond shall be placed between such street light fixture, exposed vertical power grounding conductor, or

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metallic power conduit and the communications cable strand. Temporary bonds used for this purpose shall have sufficient conductivity to carry at least 500 amperes for a period of one second without fusing.

(4) Protective grounding. Acceptable grounds for protective grounding are as follows:

(a) A vertical ground wire which has been tested, found safe, and is connected to a power system multigrounded neutral or the grounded neutral of a power secondary system where there are at least three services connected;

(b) Communications cable sheath or shield and its supporting strand where the sheath or shield is:

(i) Bonded to an underground or buried cable which is connected to a central office ground, or

(ii) Bonded to an underground metallic piping system, or

(iii) Bonded to a power system multigrounded neutral or grounded neutral of a power secondary system which has at least three services connected;

(c) Guys which are bonded to the grounds specified in subdivisions (a) and (b) of this subsection and which have continuity uninterrupted by an insulator; and

(d) If all of the preceding grounds are not available, arrays of driven ground rods where the resultant resistance to ground will be low enough to eliminate danger to personnel or permit prompt operation of protective devices.

(5) Attaching and removing temporary bonds. When attaching grounds (bonds), the first attachment shall be made to the protective ground. When removing bonds, the connection to the line or equipment shall be removed first. Insulating gloves shall be worn during these operations.

(6) Temporary grounding of suspension strand.

(a) The suspension strand shall be grounded to the existing grounds listed in subsection (4) of this section when being placed on jointly used poles.

(b) Where power crossings are encountered on nonjoint lines, the strand shall be bonded to an existing ground listed in subsection (4) of this section as close as possible to the crossing. This bonding is not required where crossings are made on a common crossing pole unless there is an upward change in grade at the pole.

(c) Where traveling roller-type bonds are used, they shall be restrained so as to avoid stressing the electrical connections.

(d) Bonds between the suspension strand and the existing ground shall be at least No. 6AWG copper.

(e) Temporary bonds shall be left in place until the strand has been tensioned, dead-ended, and permanently grounded.

(f) The requirements of subdivision (a) through (e) of this subsection do not apply to the installation of insulated strand.

(7) Antenna work-radio transmitting stations 3-30 MHz.

(a) Prior to grounding a radio transmitting station antenna, the employer shall insure that the rigger in charge:

(i) Prepares a danger tag signed with their signature,

(ii) Requests the transmitting technician to shutdown the transmitter and to ground the antenna with its grounding switch,

(iii) Is notified by the transmitting technician that the transmitter has been shutdown, and

(iv) Tags the antenna ground switch personally in the presence of the transmitting technician after the antenna has been grounded by the transmitting technician.

(b) Power shall not be applied to the antenna, nor shall the grounding switch be opened under any circumstances while the tag is affixed.

(c)(i) Where no grounding switches are provided, grounding sticks shall be used, one on each side of line, and tags shall be placed on the grounding sticks, antenna switch, or plate power switch in a conspicuous place.

(ii) To further reduce excessive radio frequency pickup, ground sticks or short circuits shall be placed directly on the transmission lines near the transmitter in addition to the regular grounding switches.

(iii) In other cases, the antenna lines may be disconnected from ground and the transmitter to reduce pickup at the point in the field.

(d) All radio frequency line wires shall be tested for pickup with an insulated probe before they are handled either with bare hands or with metal tools.

(e) The employer shall insure that the transmitting technician warn the riggers about adjacent lines which are, or may become energized.

(f) The employer shall insure that when antenna work has been completed, the rigger in charge of the job returns to the transmitter, notifies the transmitting technician in charge that work has been completed, and personally removes the tag from the antenna ground switch.

[Statutory Authority: Chapter 49.17 RCW, 94-15-096 (Order 94-07), § 296-32-320, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-320, filed 12/30/76; Order 75-41, § 296-32-320, filed 12/19/75.]

WAC 296-32-330 Overhead lines. (1) Handling suspension strand.

(a) The employer shall insure that when handling cable suspension strand which is being installed on poles carrying exposed energized power conductors, employees shall wear insulating gloves and shall avoid body contact with the strand until after it has been tensioned, dead-ended and permanently grounded.

(b) The strand shall be restrained against upward movement during installation:

(i) On joint-use poles, where there is an upward change in grade at the pole, and

(ii) On nonjoint-use poles, where the line crosses under energized power conductors.

(2) Need for testing wood poles. Unless temporary guys or braces are attached, the following poles shall be tested in accordance with subsection (3) of this section and determined to be safe before employees are permitted to climb them:

(a) Dead-end poles, except properly braced or guyed "Y" or "T" cable junction poles,

(b) Straight line poles which are not storm guyed and where adjacent span lengths exceed 165 feet.

(c) Poles at which there is a downward change in grade and which are not guyed or braced corner poles or cable junction poles.

(d) Poles which support only telephone drop wire, and

(e) Poles which carry less than ten communication line wires. On joint use poles, one power line wire shall be con-

sidered as two communication wires for purposes of this subdivision (2)(e).

(3) Methods for testing wood poles. The following method or an equivalent method shall be used for testing wood poles:

(a) Rap the pole sharply with a lineman's hammer, starting near the ground line and continuing upwards circumferentially around the pole to a height of approximately 6 feet. The hammer will produce a clear sound and rebound sharply when striking sound wood. Decay pockets will be indicated by a dull sound and/or a less pronounced hammer rebound. When decay pockets are indicated, the pole shall be considered unsafe.

(b) The pole shall be prodded as near the ground line as possible using a pole prod or a screwdriver with a single blade at least five inches long.

(c) If the pole is found unsafe, it shall be guyed or braced or supported in such a manner as to allow workers to safely perform their work.

(4) Unsafe poles or structures.

(a) Poles or structures determined to be unsafe by test or observation may not be climbed until made safe by guying, bracing or other means.

(b) Poles determined to be unsafe to climb shall, until they are made safe, be marked in a conspicuous place to alert and warn all employees of the unsafe condition.

(5) Test requirements for cable suspension strand.

(a) Before attaching a splicing platform to a cable suspension strand, the strand shall be tested and determined to have strength sufficient to support the weight of the platform and the employee. Where the strand crosses above power wires or railroad tracks it may not be tested but shall be inspected in accordance with subsection (6) of this section.

(b) The following method or an equivalent method shall be used for testing the strength of the strand: A rope, at least three-eighths inches in diameter, shall be thrown over the strand. On joint lines, the rope shall be passed over the strand using tree pruner handles or a wire raising tool. If two employees are present, both shall grip the double rope and slowly transfer their entire weight to the rope and attempt to raise themselves off the ground. If only one employee is present, one end of the rope which has been passed over the strand shall be tied to the bumper of the truck, or other equally secure anchorage. The employee then shall grasp the other end of the rope and attempt to raise himself off the ground.

(6) Inspection of strand. Where strand passes over electric power wires or railroad tracks, it shall be inspected from an elevated working position at each pole supporting the span in question. The strand may not be used to support any splicing platform, scaffold or cable car, if any of the following conditions exist:

(a) Corrosion so that no galvanizing can be detected,

(b) One or more wires of the strand are broken,

(c) Worn spots, or

(d) Burn marks such as those caused by contact with electric power wires.

(7) Outside work platforms. Unless railings are provided, safety straps and body belts shall be used while working on elevated work platforms such as aerial splicing plat-

forms, pole platforms, ladder platforms and terminal balconies.

(8) Other elevated locations. Safety straps and body belts shall be worn when working at elevated positions on poles, towers or similar structures, which do not have guarded work areas.

(9) Installing and removing wire and cable. Before installing or removing wire or cable, the pole or structure shall be guyed, braced, or otherwise supported, as necessary, to prevent failure of the pole or structure.

(10) Avoiding contact with energized power conductors or equipment. When cranes, derricks, or other mechanized equipment are used for setting, moving, or removing poles, all necessary precautions shall be taken to avoid contact with energized power conductors or equipment.

(11) Handling poles near energized power conductors.

(a) Joint use poles may not be set, moved, or removed where the nominal voltage of open electrical power conductors exceeds 34.5 kV phase to phase or 20 kV phase to ground.

(b) Poles that are to be placed, moved or removed during heavy rains, sleet or wet snow in joint lines carrying more than 8.7 kV phase to phase voltage or 5 kV phase to ground shall be guarded or otherwise prevented from direct contact with overhead energized power conductors.

(c)(i) In joint lines where the power voltage is greater than 750 volts but less than 34.5 kV phase to phase or 20 kV phase to ground, wet poles being placed, moved or removed shall be insulated with either a rubber insulating blanket, a fiberglass box guide, or equivalent protective equipment.

(ii) In joint lines where the power voltage is greater than 8.7 kV phase to phase or 5 kV phase to ground but less than 34.5 kV phase to phase or 20 kV phase to ground, dry poles being placed, moved, or removed shall be insulated with either a rubber insulating blanket, a fiberglass box guide, or equivalent protective equipment.

(iii) Where wet or dry poles are being removed, insulation of the pole is not required if the pole is cut off 2 feet or more below the lowest power wire and also cut off near the ground line.

(d) Insulating gloves shall be worn when handling the pole with either hands or tools, when there exists a possibility that the pole may contact a power conductor. Where the voltage to ground of the power conductor exceeds 15 kV to ground, Class II gloves (as defined in ANSI J6.6-1971) shall be used. For voltages not exceeding 15 kV to ground, insulating gloves shall have a breakdown voltage of at least 17 kV.

(e) The guard or insulating material used to protect the pole shall meet the appropriate 3 minute proof test voltage requirements contained in the ANSI J6.4-1971.

(f) When there exists a possibility of contact between the pole or the vehicle-mounted equipment used to handle the pole, and an energized power conductor, the following precautions shall be observed:

(i) When on the vehicle which carries the derrick, avoid all contact with the ground, with persons standing on the ground, and with all grounded objects such as guys, tree limbs, or metal sign posts. To the extent feasible, remain on the vehicle as long as the possibility of contact exists.

(ii) When it is necessary to leave the vehicle, step onto an insulating blanket and break all contact with the vehicle before stepping off the blanket and onto the ground. As a last resort, if a blanket is not available, the employee may jump cleanly from the vehicle.

(iii) When it is necessary to enter the vehicle, first step onto an insulating blanket and break all contact with the ground, grounded objects and other persons before touching the truck or derrick.

(12) Working position on poles. Climbing and working are prohibited above the level of the lowest electric power conductor on the pole (exclusive of vertical runs and street light wiring), except:

(a) Where communications facilities are attached above the electric power conductors, and a rigid fixed barrier is installed between the electric power facility and the communications facility, or

(b) Where the electric power conductors are cabled secondary service drops carrying less than 300 volts to ground and are attached 40 inches or more below the communications conductors or cables.

(13) Metal tapes and ropes.

(a) Metal measuring tapes, metal measuring ropes, or tapes containing conductive strands shall not be used when working near exposed energized parts.

(b) Where it is necessary to measure clearances from energized parts, only nonconductive devices shall be used.

[Order 76-38, § 296-32-330, filed 12/30/76; Order 75-41, § 296-32-330, filed 12/19/75.]

WAC 296-32-340 Underground lines and cable vaults. The provisions of this section apply to the guarding of manholes and street openings, and to the ventilation and testing for gas in manholes and unvented vaults, where telecommunications field work is performed on or with underground lines.

(1) Guarding manholes and street openings.

(a) When covers of manholes or vaults are removed, the opening shall be promptly guarded by a railing, temporary cover, or other acceptable temporary barrier to prevent an accidental fall through the opening and to protect employees working in the manhole from foreign objects entering the manhole.

(b) When work is to be performed on underground plant, the immediate foreman in charge and the craftsman assigned to do the work shall make a complete evaluation of the work location in regard to the hazards that are created or that could exist prior to beginning the work in underground plant.

(c) The immediate foreman and the craftsman responsible for the job completion shall be in agreement of the proper method of eliminating or reducing any hazards that are present or could be caused by the location of the work site, before the job proceeds.

(2) Requirements prior to entry of manholes and unvented vaults.

(a) The internal atmosphere shall be tested for combustible gas.

(b) Mechanical forced air ventilation shall be in operation at all times when workers are required to be in the manhole.

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(c) The mechanical forced air equipment provided shall be of a quantity to replace the exhausted air and shall be tempered when necessary.

(d) Ventilation equipment shall be designed in such a manner that workers will not be subjected to excessive air velocities.

(3) Joint power and telecommunication manholes. While work is being performed in a manhole occupied jointly by an electric utility and a telecommunication utility, an employee with basic first aid training shall be available in the immediate vicinity to render emergency assistance as required. This employee is not to be precluded from occasionally entering a manhole to provide assistance other than in an emergency. The requirement of WAC 296-32-340(3) does not preclude a qualified employee, working alone, from entering for brief periods of time, a manhole where energized cables or equipment are in service, for the purpose of inspection, housekeeping, taking readings, or similar work if such work can be performed safely.

(4) Ladders.

(a) Ladders shall be used to enter and exit manholes exceeding four feet in depth.

(b) Metal manhole ladders shall be free of structural defects and free of accident hazards such as sharp edges and burrs. The metal shall be protected against corrosion unless inherently corrosion-resistant.

(c) These ladders may be designed with parallel side rails, or with side rails varying uniformly in separation along the length (tapered) or with side rails flaring at the base to increase stability.

(d) The spacing of rungs or steps shall be on 12-inch centers.

(e) Connections between rungs or steps and side rails shall be constructed to ensure rigidity as well as strength.

(f) Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping.

(g) Ladder hardware shall meet the ladder's component parts and shall be of a material that is protected against corrosion unless inherently corrosion-resistant. Metals shall be so selected as to avoid excessive galvanic action.

(5) Flames. When open flames must be used in manholes, the following precautions shall be taken to protect against the accumulation of combustible gas:

(a) A test for combustible gas shall be made immediately before using any open flame device, and

(b) A fuel tank (e.g., acetylene) may not be in the manhole unless in actual use.

[Order 76-38, § 296-32-340, filed 12/30/76; Order 75-41, § 296-32-340, filed 12/19/75.]

WAC 296-32-350 Microwave transmission. (1) Eye protection. Employers shall insure that employees do not look into an open waveguide which is connected to an energized source of microwave radiation.

(2) Hazardous area. Accessible areas associated with microwave communication systems where the electromagnetic radiation level exceeds the radiation protection guide given in WAC 296-62-09005 shall be posted as described in

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that section. The lower half of the warning symbol shall include the following:

Radiation in this area may exceed hazard limitations and special precautions are required. Obtain specific instruction before entering.

(3) Protective measures. When an employee works in an area where the electromagnetic radiation exceeds the radiation protection guide, the employer shall institute measures that insure that the employee's exposure is not greater than that permitted by the radiation guide. Such measures shall include, but not be limited to those of an administrative or engineering nature or those involving personal protective equipment.

[Order 76-38, § 296-32-350, filed 12/30/76; Order 75-41, § 296-32-350, filed 12/19/75.]

WAC 296-32-360 Tree trimming—Electrical hazards. (1) General.

(a) Employees engaged in pruning, trimming, removing, or clearing trees from lines shall be required to consider all overhead and underground electrical power conductors to be energized with potentially fatal voltages, never to be touched (contacted) either directly or indirectly.

(b) Employees engaged in line-clearing operations shall be instructed that:

(i) A direct contact is made when any part of the body touches or contacts an energized conductor, or other energized electrical fixture or apparatus.

(ii) An indirect contact is made when any part of the body touches any object in contact with an energized electrical conductor, or other energized fixture or apparatus.

(iii) An indirect contact can be made through conductive tools, tree branches, truck equipment, or other objects, or as a result of communications wires, cables, fences, or guy wires being accidentally energized.

(iv) Electric shock will occur when an employee, by either direct or indirect contact with an energized conductor, energized tree limb, tool, equipment, or other object, provides a path for the flow of electricity to a grounded object or to the ground itself. Simultaneous contact with two energized conductors will also cause electric shock which may result in serious or fatal injury.

(c) Before any work is performed in proximity to energized conductors, the system operator/owner of the energized conductors shall be contacted to ascertain if they know of any hazards associated with the conductors which may not be readily apparent. This rule does not apply when operations are performed by the system operator/owner.

(2) Working in proximity to electrical hazards.

(a) Employers shall ensure that a close inspection is made by the employee and by the crewleader or supervisor in charge before climbing, entering, or working around any tree, to determine whether an electrical power conductor passes through the tree, or passes within reaching distance of an employee working in the tree. If any of these conditions exist either directly or indirectly, an electrical hazard shall be considered to exist unless the system operator/owner has caused the hazard to be removed by deenergizing the lines, or installing protective equipment.

(b) Only employees or trainees, familiar with the special techniques and hazards involved in line clearance, shall be permitted to perform the work if it is found that an electrical hazard exists.

(c) During all tree working operations aloft where an electrical hazard of more than 750 volts exists, there shall be a second employee or trainee qualified in line clearance tree trimming within normal voice communication.

(d) Where tree work is performed by employees qualified in line-clearance tree trimming and trainees qualified in line-clearance tree trimming, the clearances from energized conductors given in Table 2 shall apply.

TABLE 2

Minimum Working Distances From Energized Conductors For Line-Clearance Tree Trimmers and Line-Clearance Tree-Trimner Trainees

Voltage Range (Phase to Phase) (kilovolts)	Minimum Working Distance
2.1 to 15.0	2 ft. 0 in.
15.1 to 35.0	2 ft. 4 in.
35.1 to 46.0	2 ft. 6 in.
46.1 to 72.5	3 ft. 0 in.
72.6 to 121.0	3 ft. 4 in.
138.0 to 145.0	3 ft. 6 in.
161.0 to 169.0	3 ft. 8 in.
230.0 to 242.0	5 ft. 0 in.
345.0 to 362.0	7 ft. 0 in.
500.0 to 552.0	11 ft. 0 in.
700.0 to 765.0	15 ft. 0 in.

(e) Branches hanging on an energized conductor may only be removed using insulated equipment by a qualified electrical worker.

(f) Rubber footwear, including lineman's overshoes, shall not be considered as providing any measure of safety from electrical hazards.

(g) Ladders, platforms, and aerial devices, including insulated aerial devices, shall not be brought in contact with an electrical conductor. Reliance shall not be placed on their dielectric capabilities.

(h) When an aerial lift device contacts an electrical conductor, the truck supporting the aerial lift device shall be considered as energized.

(3) Storm work and emergency conditions.

(a) Since storm work and emergency conditions create special hazards, only authorized representatives of the electric utility system operator/owner and not telecommunication workers may perform tree work in these situations where energized electrical power conductors are involved.

(b) When an emergency condition develops due to tree operations, work shall be suspended and the system operator/owner shall be notified immediately.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-32-360, filed 7/20/94, effective 9/20/94; Order 76-38, § 296-32-360, filed 12/30/76; Order 75-41, § 296-32-360, filed 12/19/75.]

WAC 296-32-370 Buried facilities—Communications lines and power lines in the same trench. [Reserved.]

[Order 75-41, § 296-32-370, filed 12/19/75.]

Chapter 296-36 WAC

SAFETY STANDARDS—COMPRESSED AIR WORK

WAC

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WAC 296-36-010 Definitions. As used herein, the following terms mean:

(1) **Approved.** In compliance with a subsisting resolution of approval adopted by the department of labor and industries, division of safety.

(2) **Adequate.** The term when applied to materials, devices, structures, methods and procedures is synonymous with effective, equal, equivalent, firm, necessary, proper, safe, secure, substantial, sufficient, suitable and shall denote such kind and quality as a reasonable and prudent man experienced in compressed air work would require in order to provide safe working conditions for himself in the performance of the work.

(3) **Bulkhead.** An upright partition in tunnels separating compartments; a structure or partition capable of resisting pressure and separating a high pressure compartment from a low pressure compartment.

(4) **Caisson.** A structure in or by means of which excavation in a predominantly vertical direction is carried on by persons working in a compressed air environment.

(5) **Compressed air worker.** A person performing any work or duty in compressed air. This term does not include divers.

(6) **Designated person.** A person selected and directed by an employer to perform a specified task or duty.

(7) **Director.** The director of the department of labor and industries, state of Washington.

(8) **Effective, equal, equivalent.** See (2), "adequate."

(9) **Firm.** See (2), "adequate."

(10) **Job.** The site, buildings, equipment and operations proximately associated with the work in compressed air.

(11) **Lock.** A chamber designed to facilitate the passage of men, materials and equipment from one ambient air pressure to another ambient air pressure.

(a) **Emergency lock.** A lock chamber designed to hold and to permit the quick passage of an entire shift of compressed air workers.

(b) **Man lock.** A lock chamber through which only men pass.

(c) **Materials lock.** A lock chamber designed and used normally for the passage of materials and equipment.

(d) **Medical lock.** A special lock chamber in which men suffering from decompression illness are placed for medical attention and treatment. Also used as a facility for preemployment physical examinations.

(12) **Necessary.** See (2), "adequate."

(13) **Owner.** The person, real or corporate, for whom the construction is being done.

(14) **Pressure.**

(a) **Absolute.** Gage pressure plus one atmosphere; viz, at sea level with a gage pressure of 30 pounds per square inch, the absolute pressure is $30 + 14.7 = 44.7$ pounds per square inch.

(b) **Ambient.** That which encompasses on all sides, surrounds. Usually taken as the gage pressure.

(c) **Atmospheric.** A pressure of one atmosphere at sea level; the pressure of air at sea level, used as a unit of measurement, equivalent to 14.7 pounds per square inch. One atmosphere of pressure is also zero pounds per square inch gage pressure.

(d) **Gage.** That pressure measured by gage and indicating the pressure in pounds per square inch exceeding one atmosphere.

(e) Normal. Atmospheric pressure of 14.7 pounds per square inch at sea level or zero gage pressure.

(f) Total. Total pressure is a pressure of one atmosphere plus gage pressure. See (14)(a), "absolute."

(15) **Safe, secure.** See (2), "adequate."

(16) **Shaft.** An excavation made from the surface of the ground the longer of axis of which forms an angle with the horizontal greater than twenty degrees.

(17) **Shafting.** An air and watertight enclosure built in the roof of a caisson and extended upward until above the ground or water level.

(18) **Shall.** The word "shall" is always mandatory.

(19) **Substantial, sufficient, suitable.** See (2), "adequate."

(20) **Supervisor.** The supervisor of safety, department of labor and industries, state of Washington.

(21) **Tunnel.** The underground excavation for a passage-way including all shafts and other openings leading to or from such excavation, and all places, buildings and equipment used in connection therewith. Tunnels which are administered as distinct units constitute separate jobs.

(22) **Working chamber.** The space or compartment in which the excavating is being done in compressed air.

[Rule I, filed 12/28/62; Part One (Definitions), filed 3/23/60.]

WAC 296-36-020 Responsibility. (1) **The owner's responsibility.** There shall be on every job involving work in compressed air an owner's representative who shall be experienced in compressed air work and who shall represent the owner in all matters of joint responsibility under the Washington labor laws and the standards of safety for the work. The owner shall advise the director of the department of labor and industries in writing of the name and address of each such representative within 24 hours after starting work on the job.

(2) **The superintendent.** There shall be on every job, while work in compressed air is in progress, a superintendent experienced in compressed air work representing the employer of compressed air workers and who shall be in full charge of the job. The employer shall advise the director of the department of labor and industries in writing of the name and address of each such superintendent within 24 hours after starting work on the job.

(3) **Employees' responsibilities.** Every employee shall be responsible for carrying out all rules which immediately concern or affect his conduct and he shall use the safety devices and means furnished for his protection.

[Rules (Part II A, B, and C), filed 12/28/62; § 22, filed 3/23/60.]

WAC 296-36-030 General operating requirements—General duty to provide safety. Every reasonable precaution shall be taken to insure the safety of the workmen whether provided herein or not.

[Rules (Part III A), filed 12/28/62.]

WAC 296-36-035 General operating requirements—Safety miner. (1) A safety miner shall be selected by the crew on each shift. He shall have at least five years' experi-

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ence as a practical miner and shall be the holder of an unexpired first-aid certificate from the Red Cross, U.S. Bureau of Mines, or the department of labor and industries. His duties shall be to check conditions to eliminate common work hazards such as loose rock, faulty timbers, poor rails, insufficient lighting, defective ladders and scaffolds, fan pipes, firing lines and other equipment directly related to the work of a miner. If such defects are found he shall immediately report the same to the superintendent.

(2) It shall be the duty of the superintendent, upon ascertaining such defects or hazards, to take immediate steps to remedy the same in compliance with the rules hereinafter set forth. A record of inspections made on each operation shall be kept on file and a copy thereof shall be submitted to the safety division of the department of labor and industries.

(3) In the event that disagreement arises out of the interpretation of these rules, then the question shall be referred to the division of safety of the department of labor and industries for its decision in accordance with the laws of the state, the safety standards, or rules and regulations issued hereunder, and a decision thus rendered shall be binding.

[Rules (Part III B), filed 12/28/62; § 15, filed 3/23/60.]

WAC 296-36-040 General operating requirements—Maintenance. All machinery, equipment, appliances, materials, structures and places on the job shall at all times be maintained in a safe condition and in good repair. Every person observing any defects shall immediately advise his immediate or higher superior.

[Rules (Part III C), filed 12/28/62; Rule 2203, § 22, filed 3/23/60.]

WAC 296-36-045 General operating requirements—Daily inspection. While work in compressed air is in progress, a competent person designated by the superintendent shall make a regular inspection at least once every day of all machinery, equipment, appliances, structures and places. Immediately upon discovery of any defect, he shall report the same in writing on forms provided by the state department of labor and industries to the person present in charge of the job. A copy of the report shall be sent immediately to the safety division of the department of labor and industries.

[Rules (Part III D), filed 12/28/62.]

WAC 296-36-050 General operating requirements—Maximum permissible pressure. No person shall be subjected to pressure exceeding 50 pounds per square inch gage except in case of emergency.

[Rules (Part III E), filed 12/28/62; § 1, filed 3/23/60.]

WAC 296-36-055 General operating requirements—Temperature in working chamber. Every effort shall be made by the best available means to prevent the wet bulb temperature exceeding 80 degrees F. A wet bulb thermometer, in good working order, shall be provided in every working chamber.

[Rules (Part III F), filed 12/28/62; § 20, Rule 2006, filed 3/23/60.]

WAC 296-36-060 General operating requirements—Bracing of working chamber, shafts and passageways. The working chamber, shafts and passageways of tunnels and caissons shall be provided with bracing as may be necessary to safely resist any superimposed loads or any forces which may cause excessive deformation of the walls.

[Rules (Part III G), filed 12/28/62; § 19, filed 3/23/60.]

WAC 296-36-065 General operating requirements—Communication. A telephone intercommunication system ready for use at all times shall be maintained between the working chamber, the power house, the source of compressed air, the place of compressed air control, the first-aid room and the superintendent's office.

EXCEPTION: Where the working chamber of a caisson is less than 150 square feet in area, such system shall be maintained between the working chamber, outside the lock and the place of compressed air control or the superintendent's office.

[Rules (Part III H), filed 12/28/62; § 8, filed 3/23/60.]

WAC 296-36-070 General operating requirements—Liquor. No person under the influence of intoxicating liquor shall be permitted to enter upon the job; nor shall any person carry any liquor on the job.

[Rules (Part III I), filed 12/28/62; § 24, Rule 2402, filed 3/23/60.]

WAC 296-36-075 General operating requirements—Identification badge. Every compressed air worker employed in the work shall wear an identification badge furnished by the employer both on and off the job. The badge shall be of durable plastic designed to be worn next to the body. The badge shall state that the wearer is employed as a compressed air worker, shall bear the address and telephone number of the medical lock, and shall contain instructions that in case of an emergency of unknown or doubtful cause or illness, the wearer shall be rushed to the medical facilities and not to a hospital.

[Rules (Part III J), filed 12/28/62; § 24, Rule 2412, filed 3/23/60.]

WAC 296-36-080 General operating requirements—Notification of civil authorities, hospitals, etc. When workmen are employed in compressed air, the owner shall see that all general hospitals, city and county health departments, local medical societies, police and fire rescue, and the county sheriff in the locality are acquainted with the fact that such work is being undertaken. These authorities and organizations shall be furnished with the names, addresses and telephone numbers of the designated medical officers as well as the location and telephone number of the medical lock. The same civil authorities shall be further notified when compressed air operations on the site are completed.

[Rules (Part III K), filed 12/28/62.]

WAC 296-36-085 General operating requirements—Instructions to be posted. The following instructions as well as supplemental instructions deemed advisable by the medical officer for the guidance of compressed air workers shall

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be printed and conspicuously posted in the change house and in the man locks:

- (1) Never go on shift with an empty stomach.
- (2) Avoid all alcoholic liquors.
- (3) Eat moderately.
- (4) Sleep at least seven hours daily.
- (5) Take extra outer clothing into the tunnel when going on shift and wear it during decompression to avoid chilling during that period.
- (6) Take a warm bath after each shift.
- (7) Do not give men, suffering from compressed air illness, any intoxicating liquor.
- (8) After you have had a cold, or if your ears are uncomfortable, or if you do not feel well for any reason, report at once to the medical lock for a checkup.
- (9) If you are taken sick away from the plant, communicate at once with the physician-in-charge, Dr. , telephone
- (10) Wear your identification badge so it will be known what to do with you in an emergency.
- (11) See that you are reexamined as required by the rules.
- (12) Proper decompression means safety and freedom from compressed air illness.
- (13) No person shall smoke or carry lighted smoking materials in compressed air. No matches, mechanical or chemical igniters will be permitted in the working chamber except those necessary for welding or flame cutting operations.

It shall be the duty and responsibility of each employee to observe and abide by the posted instructions and regulations.

[Rules (Part III L), filed 12/28/62; Rule 2204, filed 3/23/60.]

WAC 296-36-100 Compression and decompression of workmen—General. Subject to subsections 1-5 below, compression and decompression of workmen shall be carried out in accordance with the rules hereinafter prescribed:

- (1) Compression or decompression may be carried out in accordance with such alternative regulations as are approved by the state department of labor and industries in writing.
- (2) Except in an emergency, no workman shall be compressed to a pressure exceeding 50 pounds per square inch gage unless regulations for the decompression of such workman have been approved under the foregoing paragraph of this rule.
- (3) The monograph "Decompression sickness and its prevention among compressed air workers" prepared by Gerald J. Duffner, M.D. (Captain, Medical Corps, U.S. Navy) and dated 6 November 1962, establishes the criteria for and shall be the guide in the determination of decompression methods and procedures and the preparation of decompression tables. Copies of the monograph are available from the supervisor of safety, department of labor and industries, state of Washington.

(4) A special low-pressure decompression chamber of sufficient size to accommodate the entire force of workmen being decompressed at the end of a shift shall be provided under the following circumstances:

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Excepting the infrequent, occasional or emergency condition, when any regularly established routine term or schedule of work includes a working period requiring a total time of decompression exceeding seventy-five minutes, the special low-pressure decompression chamber shall be provided and shall be used as a facility to accomplish the final stage or phase of decompression. The special chamber shall conform with and shall be operated in accordance with sections WAC 296-36-130 and 296-36-120(2) example No. 2 respectively.

(5) When a workman has, within the immediately preceding period of 8 hours, been exposed to a pressure greater than 13 pounds per square inch gage and has to be compressed in a man lock other than the lock in which he was last decompressed, he shall, before compression, produce to the lock attendant written particulars signed by the lock attendant of the lock where he was last decompressed indicating his last working period. For the purposes of these regulations, the term "working period" shall mean the period or the sum of the periods during which, since last subject to ordinary atmospheric pressure for at least 8 consecutive hours, a workman has been under pressure in a working chamber or chambers; the written particulars shall be specific in stating the length of time the workman was exposed to compressed air, the gage pressure to which he was subjected, the schedule of decompression used, the total length of time devoted to decompression procedures and the hour at which decompression was completed. As soon as practicable, all data shall be entered in the prescribed register or log at the lock where he is compressed and the data shall, as soon as practicable, be communicated to the attendant at any other lock from which the workman is liable to return to the open air.

[Rules (Part IV A), filed 12/28/62; § 2, filed 3/23/60.]

WAC 296-36-105 Compression and decompression of workmen—Compression. During the compression of workmen, the pressure shall not, in the first minute after starting compression, be increased to more than 3 pounds per square inch gage. When the pressure of 3 pounds per square inch gage is reached, the pressure shall not be further increased until after the lapse of a period sufficiently long to enable the lock attendant to ascertain whether any workman in the man lock complains of discomfort. After the lapse of that period, the pressure shall not be increased at a rate faster than 10 pounds per square inch gage per minute and a pause similar to that provided at 3 pounds per square inch gage shall also be provided at a pressure not exceeding 7 pounds per square inch gage. In all instances the pressure shall be increased gradually so as to insure, as far as practicable, that no workman suffers discomfort. If a workman complains of discomfort, and such complaint is signified to the lock attendant, any compression then proceeding shall be immediately stopped, and, unless the workman who has complained of the discomfort reports within 5 minutes that the discomfort has ceased and such report is conveyed to the lock attendant, the lock attendant shall without further delay gradually reduce the pressure in the lock until the workman reports that the discomfort has ceased; but, if he does not so report, the pressure shall be reduced gradually to atmospheric pressure and the workman released from the lock.

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[Rules (Part IV B), filed 12/28/62.]

WAC 296-36-110 Compression and decompression of workmen—Decompression—General. (1) **Working period.** The "working period" shall include the time or period or the sum of periods during which, since last subject to ordinary atmospheric pressure for at least 8 consecutive hours, a workman has been under pressure in a working chamber or chambers.

(2) **Work pressure.** The "work pressure" means the highest pressure to which the workman has been exposed in the course of his working period: Provided, That,

(a) Sudden and exceptional variations of pressure involving excess pressure for not more than 15 minutes may be disregarded;

(b) Where, during the whole of his working period a workman about to be decompressed has been in a working chamber in which (as in tidal waters) the pressure has been gradually varied by more than 5 pounds per square inch in the course of that period, the work pressures shall be the mean of the pressures half way through that period and at the end of it.

(3) **Decompression required.** No person employed in compressed air shall be permitted to pass from the place in which the work is being done to atmospheric pressure, except after decompression in accordance with the procedures hereinafter established.

[Rules (Part IV C), filed 12/28/62; §§ 1 and 2, filed 3/23/60.]

WAC 296-36-115 Compression and decompression of workmen—Method and procedure. Decompressions shall be accomplished in accordance with the following methods and procedures:

(1) **Normal condition.** A normal condition is one during which exposure to compressed air is limited to a single continuous "working period" followed by a single decompression in any given 24 hour period; the total time of exposure to compressed air during the single continuous "working period" is not interrupted by exposure to normal atmospheric pressure; and a second exposure to compressed air does not occur until at least 8 consecutive hours of exposure to normal atmospheric pressure has elapsed since the workman has been under pressure in a working chamber. Decompression for normal condition shall be in accordance with the decompression tables.

(2) **Multiple exposures or emergency conditions.** The appointed physician shall be responsible for the preparation and establishment of methods and procedures of decompression applicable to multiple exposures and emergency conditions. The decompression times and stages shall be calculated and the methods and procedures determined and placed into effect in accordance with the instructions contained in the monograph "Decompression sickness and its prevention among compressed air workers" referred to in WAC 296-36-100(3).

[Rules (Part IV D), filed 12/28/62.]

WAC 296-36-120 Compression and decompression of workmen—Decompression tables. (1) **Explanation.**

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(a) The decompression tables are computed for working chamber pressures from 14 to 50 pounds per square inch gage inclusive by 2 pound increments and for exposure times for each pressure extending from 1/2 to over 8 hours inclusive. Decompressions will be conducted by two or more stages with a maximum of 4 stages, the latter for a working chamber pressure of 40 pounds per square inch gage or over.

(b) Stage 1, consists of a reduction in ambient pressure ranging from 10 to a maximum of 16 pounds per square inch but in no instance will the pressure be reduced below 4 pounds at the end of stage 1. This reduction in pressure in stage 1 will always take place at a rate of 5 pounds per minute.

(c) Further reduction in pressure will take place during stage 2 and subsequent stages as required at a slower rate but in no event at a rate greater than one pound per minute.

(d) Decompression table No. 1 indicates in the body of the table the total decompression time in minutes for various combinations of working chamber pressure and exposure time.

(e) Decompression table No. 2 in several sheets indicates for the same various combinations of working chamber pressure and exposure time the following:

(i) The number of stages required;

(ii) The reduction in pressure and the terminal pressure for each required stage;

(iii) The time in minutes through which the reduction in pressure is accomplished for each required stage;

(iv) The pressure reduction rate in minutes per pound for each required stage;

Important note: The pressure reduction in each stage is accomplished at a uniform rate. Do not interpolate between values shown on the tables. Use the next higher value of working chamber pressure or exposure time should the actual working chamber pressure or the actual exposure time, respectively, fall between those for which calculated values are shown in the body of the tables.

(2) **Examples.**

(a) **Example No. 1.** 4 hour working period at 20 pounds gage.

Decompression table No. 1.
20 pounds for 4 hours,
Total decompression time 43 minutes

Decompression table No. 2.

Stage 1

Reduce pressure from 20 pounds to 4 pounds at the uniform rate of 5 pounds per minute. Elapsed time stage 1:

$$\frac{16}{5} = 3 \text{ minutes}$$

Stage 2 (final stage)

Reduce pressure at a uniform rate from 4 pounds to zero pounds gage over a period of 40 minutes.

Rate= 0.10 pounds per minute or 10.00 minutes per pound Stage 2 (final) elapsed time
Total time $\frac{40 \text{ minutes}}{43 \text{ minutes}}$

(b) **Example No. 2.** 5 hour working period at 24 pounds gage

Decompression table No. 1
24 pounds for 5 hours
Total decompression time 117 minutes

Decompression table No. 2

Stage 1

Reduce pressure from 24 pounds to 8 pounds at the uniform rate of 5 pounds per minute

Elapsed time stage 1,
 $\frac{16}{5} = 3 \text{ minutes}$

Stage 2

Reduce pressure at a uniform rate from 8 pounds to 4 pounds over a period of 4 minutes.

Rate, 1 pound per minute
Elapsed time, stage 2 4 minutes

Transfer men to special decompression chamber maintaining the 4 pound pressure during the transfer operation

Stage 3 (Final stage)

In the special decompression chamber reduce the pressure at a uniform rate from 4 pounds to zero pounds gage over a period of 110 minutes.

Rate, 0.037 pounds per minute or 27.5 minutes per pound
Stage 3 (final stage) $\frac{\text{Elapsed time } 110 \text{ minutes}}{\text{Total time } 117 \text{ minutes}}$

(3)

DECOMPRESSION TABLE NO. 1

Work Pressure	Total Decompression Time - Minutes										
	Working Period Hours										
psig	1/2	1	1-1/2	2	3	4	5	6	7	8	Over 8
0-14	6	6	6	6	6	6	6	6	16	16	32
16	7	7	7	7	7	7	17	33	48	48	63
18	7	7	7	3	11	17	48	63	63	73	87
20	7	7	8	15	15	43	63	73	83	103	113
22	9	9	16	24	38	68	93	103	113	128	133
24	11	12	23	27	52	92	117	122	127	137	151
26	13	14	29	34	69	104	126	141	142	142	163
28	15	23	31	41	98	127	143	153	153	165	183
30	17	28	38	62	105	143	165	168	173	188	204
32	19	35	43	85	126	163	178	193	203	213	226
34	21	39	58	98	151	178	195	218	223	233	248
36	24	44	63	113	170	198	223	233	243	253	273
38	28	49	73	128	178	203	223	238	253	263	278
40	31	49	84	143	183	213	233	248	258	268	288
42	37	56	102	144	189	215	245	260	263	268	293
44	43	64	118	154	199	234	254	264	269	269	293
46	44	74	139	171	214	244	269	274	289	299	318
48	51	89	144	189	229	269	299	309	319	319	-
50	58	94	164	209	249	279	309	329	-	-	-

(4)

DECOMPRESSION TABLE NO. 2

Decompression Data							
Working Chamber Pressure	Working Period	Stage No.	Pressure Reduction Psig		Time in Stage Minutes	Pressure Reduction Rate Min/Pound	Total Time Decompress Minutes
			From	To			
14	1/2	1	14	4	2	0.20	6
		2	4	0	4	1.00	
	1	1	14	4	2	0.20	6
		2	4	0	4	1.00	
	1-1/2	1	14	4	2	0.20	6
		2	4	0	4	1.00	
	2	1	14	4	2	0.20	6
		2	4	0	4	1.00	
	3	1	14	4	2	0.20	6
		2	4	0	4	1.00	
	4	1	14	4	2	0.20	6
		2	4	0	4	1.00	
	5	1	14	4	2	0.20	6
		2	4	0	4	1.00	
	6	1	14	4	2	0.20	6
		2	4	0	4	1.00	
7	1	14	4	2	0.20	16	
	2	4	0	14	3.50		
8	1	14	4	2	0.20	16	
	2	4	0	14	3.50		
Over 8	1	14	4	2	0.20	32	
	2	4	0	30	7.50		
16	1/2	1	16	4	3	0.20	7
		2	4	0	4	1.00	
	1	1	16	4	3	0.20	7
		2	4	0	4	1.00	
	1-1/2	1	16	4	3	0.20	7
		2	4	0	4	1.00	
	2	1	16	4	3	0.20	7
		2	4	0	4	1.00	
	3	1	16	4	3	0.20	7
		2	4	0	4	1.00	
	4	1	14	4	3	0.20	7
		2	4	0	4	1.00	
	5	1	14	4	3	0.20	17
		2	4	0	14	3.50	
	6	1	14	4	3	0.20	33
		2	4	0	30	7.50	
7	1	14	4	3	0.20	48	
	2	4	0	45	11.25		
8	1	14	4	3	0.20	48	
	2	4	0	45	11.25		

Decompression Data							
Working Chamber Pressure	Working Period	Stage No.	Pressure Reduction Psig		Time in Stage Minutes	Pressure Reduction Rate Min/Pound	Total Time Decompress Minutes
			From	To			
18	1/2	1	14	4	3	0.20	63
		2	4	0	60	15.00	
	1	1	18	4	3	0.20	7
		2	4	0	4	1.00	
	1-1/2	1	18	4	3	0.20	7
		2	4	0	4	1.00	
	2	1	18	4	3	0.20	8
		2	4	0	5	1.25	
	3	1	18	4	3	0.20	11
		2	4	0	8	2.00	
	4	1	18	4	3	0.20	17
		2	4	0	14	3.50	
	5	1	18	4	3	0.20	48
		2	4	0	45	11.25	
	6	1	18	4	3	0.20	63
		2	4	0	60	15.00	
7	1	18	4	3	0.20	63	
	2	4	0	60	15.00		
8	1	18	4	3	0.20	73	
	2	4	0	70	17.50		
Over 8	1	18	4	3	0.20	87	
	2	4	0	84	21.00		
20	1/2	1	20	4	3	0.20	7
		2	4	0	4	1.00	
	1	1	20	4	3	0.20	7
		2	4	0	4	1.00	
	1-1/2	1	20	4	3	0.20	8
		2	4	0	5	1.25	
	2	1	20	4	3	0.20	15
		2	4	0	12	3.00	
	3	1	20	4	3	0.20	15
		2	4	0	12	3.00	
	4	1	20	4	3	0.20	43
		2	4	0	40	10.00	
	5	1	20	4	3	0.20	63
		2	4	0	60	15.00	
	6	1	20	4	3	0.20	73
		2	4	0	70	17.50	
7	1	20	4	3	0.20	83	
	2	4	0	80	20.00		
8	1	20	4	3	0.20	103	
	2	4	0	100	25.00		
Over 8	1	20	4	3	0.20	113	
	2	4	0	110	27.50		

Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage No.	Pressure Reduction Psig		Time in Stage Minutes	Pressure Reduction Rate Min/Pound	
			From	To			
22	1/2	1	22	6	3	0.20	9
		2	6	0	6	1.00	
1		1	22	6	3	0.20	9
		2	6	0	6	1.00	
1-1/2		1	22	6	3	0.20	16
		2	6	0	13	2.20	
2		1	22	6	3	0.20	24
		2	6	0	21	3.50	
3		1	22	6	3	0.20	38
		2	6	0	35	5.85	
4		1	22	6	3	0.20	68
		2	6	0	65	10.83	
5		1	22	6	3	0.20	93
		2	6	0	90	15.00	
6		1	22	6	3	0.20	103
		2	6	0	100	16.67	
7		1	22	6	3	0.20	113
		2	6	0	110	18.35	
8		1	22	6	3	0.20	128
		2	6	0	125	20.80	
Over 8		1	22	6	3	0.20	133
		2	6	0	130	21.70	
24	1/2	1	24	3	3	0.20	11
		2	8	4	4	1.00	
		3	4	0	4	1.00	
1		1	24	8	3	0.20	12
		2	8	4	4	1.00	
		3	4	0	5	1.25	
1-1/2		1	24	8	3	0.20	23
		2	8	4	4	1.00	
		3	4	0	16	4.00	
2		1	24	8	3	0.20	27
		2	8	4	4	1.00	
		3	4	0	20	5.00	
3		1	24	8	3	0.20	52
		2	8	4	4	1.00	
		3	4	0	45	11.25	
4		1	24	8	3	0.20	92
		2	8	4	4	1.00	
		3	4	0	85	21.25	
5		1	24	8	3	0.20	117
		2	8	4	4	1.00	
		3	4	0	110	27.50	
6		1	24	8	3	0.20	122
		2	8	4	4	1.00	
		3	4	0	115	28.80	
7		1	24	8	3	0.20	127
		2	8	4	4	1.00	
		3	4	0	120	30.00	

Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage No.	Pressure Reduction Psig		Time in Stage Minutes	Pressure Reduction Rate Min/Pound	
			From	To			
8		1	24	8	3	0.20	137
		2	8	4	4	1.00	
		3	4	0	130	32.50	
Over 8		1	24	8	3	0.20	151
		2	8	4	8	1.00	
		3	4	0	140	35.00	
26	1/2	1	26	10	3	0.20	13
		2	10	4	6	1.00	
		3	4	0	4	1.00	
1		1	26	10	3	0.20	14
		2	10	4	6	1.00	
		3	4	0	5	1.25	
1-1/2		1	26	10	3	0.20	29
		2	10	4	6	1.00	
		3	4	0	20	5.00	
2		1	26	10	3	0.20	34
		2	10	4	6	1.00	
		3	4	0	25	6.25	
3		1	26	10	3	0.20	69
		2	10	4	6	1.00	
		3	4	0	60	15.00	
4		1	26	10	3	0.20	104
		2	10	4	6	1.00	
		3	4	0	95	23.75	
5		1	26	10	3	0.20	126
		2	10	4	8	1.33	
		3	4	0	115	28.80	
6		1	26	10	3	0.20	141
		2	10	4	8	1.33	
		3	4	0	130	32.50	
7		1	26	10	3	0.20	142
		2	10	4	9	1.50	
		3	4	0	130	32.50	
8		1	26	10	3	0.20	142
		2	10	4	9	1.50	
		3	4	0	130	32.50	
Over 8		1	26	10	3	0.20	163
		2	10	4	30	5.00	
		3	4	0	130	32.50	
28	1/2	1	28	12	3	0.20	15
		2	12	4	8	1.00	
		3	4	0	4	1.00	
1		1	28	12	3	0.20	23
		2	12	4	8	1.00	
		3	4	0	12	3.00	
1-1/2		1	28	12	3	0.20	31
		2	12	4	8	1.00	
		3	4	0	20	5.00	
2		1	28	12	3	0.20	41
		2	12	4	8	1.00	
		3	4	0	30	7.50	

Working Chamber Pressure		Working Period		Decompression Data				Total Time Decompress
psig	Hours	Stage No.	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Minutes	
			From	To	Minutes	Min/Pound		
30	1/2	1	28	12	3	0.20	98	
		2	12	4	10	1.25		
		3	4	0	85	21.20		
	4	1	28	12	3	0.20		127
		2	12	4	14	1.75		
		3	4	0	110	27.50		
	5	1	28	12	3	0.20		143
		2	12	4	20	2.50		
		3	4	0	120	30.00		
6	1	28	12	3	0.20	153		
	2	12	4	20	2.50			
	3	4	0	130	32.50			
7	1	28	12	3	0.20	153		
	2	12	4	20	2.50			
	3	4	0	130	32.50			
8	1	28	12	3	0.20	165		
	2	12	4	32	4.00			
	3	4	0	130	32.50			
Over 8	1	28	12	3	0.20	183		
	2	12	4	50	6.25			
	3	4	0	130	32.50			
30	1/2	1	30	14	3	0.20	17	
		2	14	4	10	1.00		
		3	4	0	4	1.00		
	1	1	30	14	3	0.20		28
		2	14	4	10	1.00		
		3	4	0	15	3.75		
	1-1/2	1	30	14	3	0.20		38
		2	14	4	10	1.00		
		3	4	0	25	6.25		
2	1	30	14	3	0.20	62		
	2	14	4	14	1.40			
	3	4	0	45	11.25			
3	1	30	14	3	0.20	105		
	2	14	4	17	1.70			
	3	4	0	85	21.20			
4	1	30	14	3	0.20	143		
	2	14	4	30	3.00			
	3	4	0	110	27.50			
5	1	30	14	3	0.20	165		
	2	14	4	35	3.50			
	3	4	0	130	32.50			
6	1	30	14	3	0.20	168		
	2	14	4	35	3.50			
	3	4	0	130	32.50			
7	1	30	14	3	0.20	178		
	2	14	4	45	4.50			
	3	4	0	130	32.50			
8	1	30	14	3	0.20	188		
	2	14	4	55	5.50			
	3	4	0	130	32.50			

Working Chamber Pressure		Working Period		Decompression Data				Total Time Decompress
psig	Hours	Stage No.	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	Minutes	
			From	To	Minutes	Min/Pound		
32	Over 8	1	30	14	3	0.20	204	
		2	14	4	71	7.10		
		3	4	0	130	32.50		
	1/2	1	32	16	3	0.20		19
		2	16	4	12	1.00		
		3	4	0	4	1.00		
	1	1	32	16	3	0.20		35
		2	16	4	12	1.00		
		3	4	0	20	5.00		
1-1/2	1	32	16	3	0.20	43		
	2	16	4	15	1.25			
	3	4	0	25	6.25			
2	1	32	16	3	0.20	85		
	2	16	4	22	1.83			
	3	4	0	60	15.00			
3	1	32	16	3	0.20	126		
	2	16	4	28	2.33			
	3	4	0	95	23.75			
4	1	32	16	3	0.20	163		
	2	16	4	40	3.33			
	3	4	0	120	30.00			
5	1	32	16	3	0.20	178		
	2	16	4	45	3.75			
	3	4	0	130	32.50			
6	1	32	16	3	0.20	193		
	2	16	4	60	5.00			
	3	4	0	130	32.50			
7	1	32	16	3	0.20	203		
	2	16	4	70	5.83			
	3	4	0	130	32.50			
8	1	32	16	3	0.20	213		
	2	16	4	80	6.67			
	3	4	0	130	32.50			
Over 8	1	32	16	3	0.20	226		
	2	16	4	93	7.75			
	3	4	0	130	32.50			
34	1/2	1	34	18	3	0.20	21	
		2	18	4	14	1.00		
		3	4	0	4	1.00		
	1	1	34	18	3	0.20		39
		2	18	4	14	1.00		
		3	4	0	22	5.50		
	1-1/2	1	34	18	3	0.20		58
		2	18	4	25	1.80		
		3	4	0	30	7.50		
2	1	34	18	3	0.20	98		
	2	18	4	35	2.50			
	3	4	0	60	15.00			
3	1	34	18	3	0.20	151		
	2	18	4	43	3.10			
	3	4	0	105	26.25			

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Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage No.	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	
			From	To	Minutes	Min/Pound	
	4	1	34	18	3	0.20	
		2	18	4	55	3.93	
		3	4	0	120	30.00	178
	5	1	34	18	3	0.20	
		2	18	4	62	4.43	
		3	4	0	130	32.50	195
	6	1	34	18	3	0.20	
		2	18	4	85	6.07	
		3	4	0	130	32.50	218
	7	1	34	18	3	0.20	
		2	18	4	90	6.43	
		3	4	0	130	32.50	223
	8	1	34	18	3	0.20	
		2	18	4	100	7.15	
		3	4	0	130	32.50	233
	Over 8	1	34	18	3	0.20	
		2	18	4	115	8.23	
		3	4	0	130	32.50	248
36	1/2	1	36	20	3	0.20	
		2	20	4	16	1.00	
		3	4	0	5	1.25	24
	1	1	36	20	3	0.20	
		2	20	4	16	1.00	
		3	4	0	25	6.25	44
	1-1/2	1	36	20	3	0.20	
		2	20	4	30	1.88	
		3	4	0	30	7.50	63
	2	1	36	20	3	0.20	
		2	20	4	40	2.50	
		3	4	0	70	17.50	113
	3	1	36	20	3	0.20	
		2	20	4	52	3.25	
		3	4	0	115	28.75	170
	4	1	36	20	3	0.20	
		2	20	4	65	4.06	
		3	4	0	130	32.50	198
	5	1	36	20	3	0.20	
		2	20	4	90	5.63	
		3	4	0	130	32.50	223
	6	1	37	20	3	0.20	
		2	20	4	100	6.25	
		3	4	0	130	32.50	233
	7	1	36	20	3	0.20	
		2	20	4	110	6.88	
		3	4	0	130	32.50	243
	8	1	36	20	3	0.20	
		2	20	4	120	7.50	
		3	4	0	130	32.50	253
	Over 8	1	36	20	3	0.20	
		2	20	4	140	8.75	
		3	4	0	130	32.50	273

Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress	
		Stage No.	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate		
			From	To	Minutes	Min/Pound		
	38	1/2	1	38	22	3	0.20	
			2	22	6	16	1.00	
			3	6	0	9	1.50	28
		1	1	38	22	3	0.20	
			2	22	6	16	1.00	
			3	6	0	30	5.00	49
		1-1/2	1	38	22	3	0.20	
			2	22	6	20	1.25	
			3	6	0	50	8.34	73
		2	1	38	22	3	0.20	
			2	22	6	30	1.88	
			3	6	0	95	15.83	128
		3	1	38	22	3	0.20	
			2	22	6	35	2.19	
			3	6	0	140	23.35	178
		4	1	38	22	3	0.20	
			2	22	6	50	3.12	
			3	6	0	150	25.00	203
		5	1	38	22	3	0.20	
			2	22	6	55	3.44	
			3	6	0	165	27.50	223
		6	1	38	22	3	0.20	
			2	22	6	70	4.38	
			3	6	0	165	27.50	238
		7	1	38	22	3	0.20	
			2	22	6	85	5.32	
			3	6	0	165	27.50	253
		8	1	38	22	3	0.20	
			2	22	6	95	5.93	
			3	6	0	165	27.50	263
		Over 8	1	38	22	3	0.20	
			2	22	6	110	6.88	
			3	6	0	165	27.50	278
40	1/2	1	40	24	3	0.20		
		2	24	8	16	1.00		
		3	8	4	4	1.00		
		4	4	0	8	2.00	31	
		1	1	40	24	3	0.20	
			2	24	8	16	1.00	
			3	8	4	5	1.25	
			4	4	0	25	6.25	49
		1-1/2	1	40	24	3	0.20	
			2	24	8	16	1.00	
			3	8	4	20	5.00	
			4	4	0	45	11.25	84
		2	1	40	24	3	0.20	
			2	24	8	25	1.56	
			3	8	4	20	5.00	
			4	4	0	95	23.75	143
		3	1	40	24	3	0.20	
			2	24	8	30	1.88	
			3	8	4	30	7.50	
			4	4	0	120	30.00	183

Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate Min/Pound	
			From	To	Minutes	Minutes	
4		1	40	24	3	0.20	213
		2	24	8	45	2.81	
		3	8	4	35	8.75	
		4	4	0	130	32.50	
5		1	40	24	3	0.20	233
		2	24	8	47	2.94	
		3	8	4	53	13.25	
		4	4	0	130	32.50	
6		1	40	24	3	0.20	248
		2	24	8	55	3.44	
		3	8	4	60	15.00	
		4	4	0	130	32.50	
7		1	40	24	3	0.20	258
		2	24	8	65	4.06	
		3	8	4	60	15.00	
		4	4	0	130	32.50	
8		1	40	24	3	0.20	268
		2	24	8	75	4.70	
		3	8	4	60	15.00	
		4	4	0	130	32.50	
Over 8		1	40	24	3	0.20	288
		2	24	8	95	5.93	
		3	8	4	60	15.00	
		4	4	0	130	32.50	
42	1/2	1	42	26	3	0.20	37
		2	26	10	16	1.00	
		3	10	4	6	1.00	
		4	4	0	12	3.00	
1		1	42	26	3	0.20	56
		2	26	10	16	1.00	
		3	10	4	12	2.00	
		4	4	0	25	6.25	
1-1/2		1	42	26	3	0.20	102
		2	26	10	16	1.00	
		3	10	4	23	3.83	
		4	4	0	60	15.00	
2		1	42	26	3	0.20	144
		2	26	10	16	1.00	
		3	10	4	30	5.00	
		4	4	0	95	23.75	
3		1	42	26	3	0.20	189
		2	26	10	16	1.00	
		3	10	4	50	8.34	
		4	4	0	120	30.00	
4		1	42	26	3	0.20	215
		2	26	10	17	1.06	
		3	10	4	65	10.83	
		4	4	0	130	32.50	
5		1	42	26	3	0.20	245
		2	26	10	27	1.69	
		3	10	4	85	14.18	
		4	4	0	130	32.50	
6		1	42	26	3	0.20	260
		2	26	10	27	1.69	
		3	10	4	100	16.67	
		4	4	0	130	32.50	

Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate Min/Pound	
			From	To	Minutes	Minutes	
7		1	42	26	3	0.20	263
		2	26	10	30	1.88	
		3	10	4	100	16.67	
		4	4	0	130	32.50	
8		1	42	26	3	0.20	268
		2	26	10	35	2.19	
		3	10	4	100	16.67	
		4	4	0	130	32.50	
Over 8		1	42	26	3	0.20	293
		2	26	10	60	3.75	
		3	10	4	100	16.67	
		4	4	0	130	32.50	
44	1/2	1	44	28	3	0.20	43
		2	28	12	16	1.00	
		3	12	4	8	1.00	
		4	4	0	16	4.00	
1		1	44	28	3	0.20	64
		2	28	12	16	1.00	
		3	12	4	20	2.50	
		4	4	0	25	6.25	
1-1/2		1	44	28	3	0.20	118
		2	28	12	16	1.00	
		3	12	4	27	3.38	
		4	4	0	72	18.00	
2		1	44	28	3	0.20	154
		2	28	12	16	1.00	
		3	12	4	40	5.00	
		4	4	0	95	23.75	
3		1	44	23	3	0.20	199
		2	28	12	16	1.00	
		3	12	4	60	7.50	
		4	4	0	120	30.00	
4		1	44	28	3	0.20	234
		2	28	12	16	1.00	
		3	12	4	85	10.62	
		4	4	0	130	32.50	
5		1	44	28	3	0.20	254
		2	28	12	16	1.00	
		3	12	4	105	13.13	
		4	4	0	130	32.50	
6		1	44	28	3	0.20	264
		2	28	12	16	1.00	
		3	12	4	115	14.38	
		4	4	0	130	32.50	
7		1	44	28	3	0.20	269
		2	28	12	16	1.00	
		3	12	4	120	15.00	
		4	4	0	130	32.50	
8		1	44	28	3	0.20	269
		2	28	12	16	1.00	
		3	12	4	120	15.00	
		4	4	0	130	32.50	
Over 8		1	44	28	3	0.20	293
		2	28	12	40	2.50	
		3	12	4	120	15.00	
		4	4	0	130	32.50	

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Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate Min/Pound	
			From	To	Minutes	Minutes	
46	1/2	1	46	30	3	0.20	44
		2	30	14	16	1.00	
		3	14	4	10	1.00	
		4	4	0	15	3.75	
1		1	46	30	3	0.20	74
		2	30	14	16	1.00	
		3	14	4	25	2.50	
		4	4	0	30	7.50	
1-1/2		1	46	30	3	0.20	139
		2	30	14	16	1.00	
		3	14	4	35	3.50	
		4	4	0	85	21.20	
2		1	46	30	3	0.20	171
		2	30	14	16	1.00	
		3	14	4	47	4.70	
		4	4	0	105	26.25	
3		1	46	30	3	0.20	214
		2	30	14	16	1.00	
		3	14	4	65	6.50	
		4	4	0	130	32.50	
4		1	46	30	3	0.20	244
		2	30	14	16	1.00	
		3	14	4	95	9.50	
		4	4	0	130	32.50	
5		1	46	30	3	0.20	269
		2	30	14	16	1.00	
		3	14	4	120	12.00	
		4	4	0	130	32.50	
6		1	46	30	3	0.20	274
		2	30	14	16	1.00	
		3	14	4	125	12.50	
		4	4	0	130	32.50	
7		1	46	30	3	0.20	289
		2	30	14	16	1.00	
		3	14	4	140	14.00	
		4	4	0	130	32.50	
8		1	46	30	3	0.20	299
		2	30	14	16	1.00	
		3	14	4	150	15.00	
		4	4	0	130	32.50	
Over 8		1	46	30	3	0.20	318
		2	30	14	25	1.56	
		3	14	4	160	16.00	
		4	4	0	130	32.50	
48	1/2	1	48	32	3	0.20	51
		2	32	16	16	1.00	
		3	16	4	12	1.00	
		4	4	0	20	5.00	
1		1	48	32	3	0.20	89
		2	32	16	16	1.00	
		3	16	4	35	2.92	
		4	4	0	35	8.75	
1-1/2		1	48	32	3	0.20	144
		2	32	16	16	1.00	
		3	16	4	45	3.75	
		4	4	0	80	20.00	

Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate Min/Pound	
			From	To	Minutes	Minutes	
2	1	1	48	32	3	0.20	189
		2	32	16	16	1.00	
		3	16	4	60	5.00	
		4	4	0	110	27.50	
3		1	48	32	3	0.20	229
		2	32	16	16	1.00	
		3	16	4	90	7.50	
		4	4	0	120	30.00	
4		1	48	32	3	0.20	269
		2	32	16	16	1.00	
		3	16	4	120	10.00	
		4	4	0	130	32.50	
5		1	48	32	3	0.20	299
		2	32	16	16	1.00	
		3	16	4	140	11.67	
		4	4	0	130	32.50	
6		1	48	32	3	0.20	309
		2	32	16	16	1.00	
		3	16	4	160	13.33	
		4	4	0	130	32.50	
7		1	48	32	3	0.20	319
		2	32	16	16	1.00	
		3	16	4	170	14.17	
		4	4	0	130	32.50	
8		1	48	32	3	0.20	319
		2	32	16	16	1.00	
		3	16	4	170	14.17	
		4	4	0	130	32.50	
50	1/2	1	50	34	3	0.20	58
		2	34	18	16	1.00	
		3	18	4	14	1.00	
		4	4	0	25	6.25	
1		1	50	34	3	0.20	94
		2	34	18	16	1.00	
		3	18	4	40	2.86	
		4	4	0	35	8.75	
1-1/2		1	50	34	3	0.20	164
		2	34	18	16	1.00	
		3	18	4	55	3.93	
		4	4	0	90	22.50	
2		1	50	34	3	0.20	209
		2	34	18	16	1.00	
		3	18	4	70	5.00	
		4	4	0	120	30.00	
3		1	50	34	3	0.20	249
		2	34	18	16	1.00	
		3	18	4	100	7.15	
		4	4	0	130	32.50	
4		1	50	34	3	0.20	279
		2	34	18	16	1.00	
		3	18	4	130	8.58	
		4	4	0	130	32.50	
5		1	50	34	3	0.20	309
		2	34	18	16	1.00	
		3	18	4	160	11.42	
		4	4	0	130	32.50	

Working Chamber Pressure	Working Period	Decompression Data					Total Time Decompress
		Stage No.	Pressure Reduction Psig		Time in Stage	Pressure Reduction Rate	
			From	To	Minutes	Min/Pound	
psig	Hours	No.	From	To	Minutes	Min/Pound	Minutes
	6	1	50	34	3	0.20	
		2	34	18	16	1.00	
		3	18	4	180	12.85	
		4	4	0	130	32.50	329

DO NOT INTERPOLATE, USE NEXT HIGHER VALUE FOR CONDITIONS NOT COMPUTED

[Rules (Part IV E), filed 12/28/62; § 2, filed 3/23/60.]

WAC 296-36-125 Man locks. (1) **Use of man locks.** Except when prevented by an emergency, compressed air workers shall pass only through the man lock when passing into or out of a compressed air area. *Exception:* Caissons having a working area less than 150 square feet may use a combination material and man lock.

(2) **Size and capacity.** The head room in man locks shall be not less than 6 feet and their cubical content shall provide at least 30 cubic feet of air space for each person. The capacity shall be based upon such minimum space per person and shall be posted at the entrance to the lock. The posted capacity shall not be exceeded except in case of an emergency.

(3) **Equipment.** Each man lock shall be equipped with the following:

(a) A recording pressure gage, fixed to the exterior of the lock on the atmospheric pressure side, shall be installed for showing the rate of decompression. The gage dial and chart shall be of such size that the amount of rise or fall in air pressure within 5 minutes will be readily discernible. The gage shall be protected by a locked box from interference or damage. This requirement will not be necessary when working at pressures of 13 pounds per square inch or less.

(b) A clock or clocks suitably placed so that the man lock attendant and persons in the man lock can readily ascertain the time.

(c) A recording pressure gage whose chart shall be of sufficient size to register a legible record of variations in pressure within the working chamber. This gage shall be readily accessible to the lock attendant.

(d) Pressure gages which will indicate to the man lock attendant the pressure in the man lock and the pressure in each working chamber to which the man lock affords direct or indirect access and to persons in the man lock the pressure in the man lock.

(e) Valves to enable the lock attendant to reduce or cut off the supply of compressed air into the man lock.

(f) Valves and pipes in connection with the air supply and exhaust which shall be so arranged that the lock and pressure can be controlled from within and without.

(g) Effective means of verbal intercommunication between the man lock attendant and (1) persons in the man lock, (2) persons in any working chamber and (3) the air compressor plant, and also some means to enable persons in the lock to convey visible or other nonverbal signals to the lock attendant.

(h) A glass bulls-eye in each end of the lock to permit observation of the occupants.

[Title 296 WAC—p. 1056]

(4) **Seating facilities.** The seating facilities in man locks shall be so arranged as to provide a normal sitting posture without cramping. Seating space not less than 22 inches in width shall be provided per occupant. *Exception:* In caissons having a working area less than 150 square feet, portable seats shall be provided in the combination material and man lock.

(5) **Lighting and heating.** Every man lock shall be lighted by electricity. The lighting intensity shall be a minimum of 30 foot-candles as currently recommended for waiting rooms by the illuminating engineers society. It shall also be provided with a system of radiant (infra-red) heating using electricity, steam or hot water for heating the radiant surface. The radiant surface shall be so located and protected as to prevent thermal burns. The chamber shall be heated to a minimum dry bulb temperature of 70 degrees F.

(6) **Ventilation.** A minimum ventilation rate of 20 cubic feet per minute of standard air at the prevailing ambient pressure in the lock shall be provided for each occupant. In no event shall the carbon dioxide concentration be permitted to rise above 0.5 percent by volume.

(7) **Record of decompression.** Where the pressure in the working chamber is 13 pounds or more, a record of all persons passing into or out of the working chamber shall be kept by a lock attendant who shall be stationed at the low pressure side of the man lock. Such record shall show the period of stay in the working chamber and the length of time of each decompression. Such record shall be signed by the medical officer and shall be kept on the job subject to inspection by the director of the state department of labor and industries or his authorized representative.

(8) **Automatic controls.** Each man lock shall be equipped with a suitable automatic control which through taped programs or cams or similar apparatus shall automatically regulate compressions and decompressions. It shall also be equipped with a timing device and such manual control as will enable the lock attendant to override the automatic mechanism in an emergency.

[Rules (Part V A), filed 12/28/62; §§ 3 and 4, filed 3/23/60.]

WAC 296-36-130 Special decompression chamber.

(1) **General.** The special low-pressure decompression chamber shall be provided for use when the nature of the work requires decompression times and procedures clearly within the scope of WAC 296-36-110(4).

(2) **Size and capacity.** The headroom in the special decompression chamber shall be not less than 7 feet and the cubical content shall provide at least 50 cubic feet of air space for each person. For each occupant there shall be provided 4 square feet of free walking area and 3 square feet of seating space exclusive of area required for lavatory and toilet facilities. The rated capacity shall be based on the stated minimum space per person and shall be posted at the chamber entrance. The posted capacity shall not be exceeded except in case of emergency.

(3) **Equipment.** Each special decompression chamber shall be equipped with the following:

(a) A clock or clocks suitably placed so that the attendant and the chamber occupants can readily ascertain the time;

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(b) Pressure gages which will indicate to the attendant and to the chamber occupants the pressure in the chamber;

(c) Valves to enable the attendant to reduce or cut off the supply of compressed air into the chamber;

(d) Valves and pipes in connection with the air supply and exhaust arranged that the chamber pressure can be controlled from within and without;

(e) Effective means of verbal intercommunication between the attendant, occupants of the chamber and the air compressor plant;

(f) A glass bulls-eye at the entrance to permit observation of the chamber occupants.

(4) **Seating facilities.** Seating facilities in special decompression chambers shall be so arranged as to permit a normal sitting posture without cramping. Seating space not less than 18 inches by 24 inches in width shall be provided per occupant. Seat and back shall be padded or cushioned with a one-inch thickness of foam rubber or its equivalent.

(5) **Lighting and heating.** Lighting and heating shall comply with that for man locks, WAC 296-36-125(5).

(6) **Ventilation.** Ventilation shall comply with that for man locks, WAC 296-36-125(6).

(7) **Record of decompression.** Final stage decompression in the special chamber shall be part of the records required by WAC 296-36-125(7).

(8) **Automatic controls.** Special decompression chambers shall be equipped with automatic controls complying with WAC 296-36-125(8), for man locks.

(9) **Sanitation.** One toilet and one wash basin with hot and cold water in a screened or enclosed recess shall be provided for each 10 units of rated capacity as defined in WAC 296-36-130(2). An adequate supply of disposable towels, drinking water and disposable cups shall be provided. No refuse or discarded material of any kind shall be permitted to accumulate and the chamber shall be kept clean.

(10) **Location.** Where practicable the special decompression chamber shall be situated adjacent to the man lock on the atmospheric pressure side of the bulkhead. When located adjacent to the man lock a passageway shall be provided connecting the special chamber with the man lock to permit workmen in the process of decompression to move from the man lock to the special chamber without a reduction in the ambient pressure from that designated for the initial pressure of the final stage of decompression. The passageway shall be so arranged as to not interfere with the normal operation of the man lock nor with the release of the occupants of the special chamber to atmospheric pressure upon the completion of the decompression procedure.

In event that the special chamber is located remote from the man lock a means of pressurized transport shall be provided to move the men from the man lock to the special chamber without a reduction in the ambient pressure from that designated for the initial pressure of the final stage of decompression.

Under unusual circumstances or in an emergency and only with the express permission of the appointed physician, decanting procedures may be used to facilitate the movement of men at atmospheric pressure from the man lock to the special decompression chamber for the final stage of decompression.

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sion. RECOMPRESSION OF THE MEN MUST TAKE PLACE WITHIN FIVE MINUTES IN THE SPECIAL CHAMBER. THE MEDICAL LOCK SHALL NOT BE USED FOR THE RECOMPRESSION.

(11) **Design.** The special decompression chamber and passageway or pressurized transport shall be designed for an operating pressure of 20 pounds per square inch gage pressure.

(12) **Fire protection.** All applicable provisions of WAC 296-36-190, fire prevention and fire fighting shall apply to special decompression chambers.

[Rules (Part V B), filed 12/28/62.]

WAC 296-36-132 Lock attendants. (1) Whenever any workman is in a man lock or in a working chamber to which the man lock affords direct or indirect access, each working man lock shall be in the charge of a competent lock attendant who shall perform no other duties except to operate the lock and shall be employed the same number of hours as the other employees working in compressed air. The lock attendant shall control the maximum rate of compressions and shall perform all decompressions except where such compressions and decompressions are automatically regulated, but in such case the lock attendant shall have means to determine the pressures within the lock and working chamber at any time, and shall have also a timing device and such manual controls as will enable him to override the automatic mechanism in an emergency.

(2) Subject to the overall control by the lock attendant of the admission of compressed air into the lock, he may, if so authorized by the appointed physician, allocate to a competent person who is to be compressed in the lock, the duty to regulate from inside the lock the admission of compressed air, and duty to communicate to the lock attendant any complaint of discomfort by a workman in the lock and any report by that workman that the discomfort has ceased.

(3) Man lock attendants shall be under the direct supervision, control, discipline and training of the appointed physician and each man lock attendant shall be the holder of an unexpired first-aid certificate from the Red Cross, U.S. Bureau of Mines, or the Department of Labor and Industries. Lock attendants shall receive their wage payments directly from the head office of the employer and shall not be carried on or subject to the payroll procedures of the local office. A lock attendant shall not be relieved of his duties or discharged without consulting the appointed physician nor without the physician's assent.

[Rules (Part VI), filed 12/28/62; § 4, filed 3/23/60.]

WAC 296-36-135 Regulation of pressure and air quality in working areas—Gage tender. There shall at all times be a thoroughly experienced competent and reliable person on duty at the air control valves as a gage tender who shall regulate the pressure in the working areas. No gage tender shall be on duty more than 8 hours in any 24. During tunneling operations, one gage tender may regulate the pressure in not more than two headings provided that the gages and controls are all in one location. In caisson work there shall be a gage tender for each caisson.

[Rules (Part VII A), filed 12/28/62; Rule 303, filed 3/23/60.]

WAC 296-36-140 Regulation of pressure and air quality in working areas—Pressure monitoring. (1) **High pressure.** Every compressed air line used to maintain pressure in working areas shall have a pressure gage attached at a point in the immediate vicinity of the control valves to show the pressure on the high pressure side of the control valves. Such gages shall be so located and illuminated as to be easily read by the operator and shall be of such size and so graduated as to show clearly a change in pressure of one pound.

(2) **Back pressure.** Back pressure gages to show the pressure in the working areas shall be located on the low pressure side of the bulkhead, in the superintendent's office, at the air control valves and in the power house. Back pressure gages shall be maintained in accurate working order and shall be tested at least once every 24 hours and a record shall be kept of each such test. In addition to the foregoing back pressure gages, a continuous recording back pressure gage shall be installed to provide a record of variations and pressure in the working chamber. The record shall be kept in the superintendent's office and be available for inspection by the director of the state department of labor and industries. *Exception:* Caissons having a net working area less than 150 square feet shall have back pressure gages installed on the low pressure side of the caisson and at the air control valves.

[Rules (Part VII B), filed 12/28/62.]

WAC 296-36-145 Regulation of pressure and air quality in working areas—Air quality in working areas.

(1) **Ventilation.** An automatic air quality monitoring system acceptable to the director, department of labor and industries, shall be installed in the pressurized working chamber and shall at all times be maintained in proper working condition. The system shall provide continuous sampling and monitoring of the air and shall indicate by visual and audible alarm the presence of dangerous air contaminants in excess of the following:

Carbon monoxide	0.01%	100 ppm
Carbon dioxide	0.50%	5000 ppm
Oxides of nitrogen	0.0005%	5 ppm
Methane	0.25%	2500 ppm
Hydrogen sulphide	0.002%	20 ppm

The director in his discretion may change these concentrations to conform with good practices as recommended by the American Conference of Governmental Industrial Hygienists.

The system shall also indicate and give alarm at any time the oxygen content is less than 19.5 percent.

The system shall be so arranged that the visual and audible alarm will give warning in the working chamber and at the lock tender's station at the low pressure side of the locks.

In addition to the specific requirements contained in these standards of safety chapter 296-62 WAC shall apply for rock dust and ventilation.

(2) **Protection against atmospheric containments:** The requirements of chapters 296-62 and 296-155 WAC, Part Q shall apply.

[Title 296 WAC—p. 1058]

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-36-145, filed 8/13/90, effective 9/24/90; Rules (Part VII C), filed 12/28/62; § 25, filed 3/23/60.]

WAC 296-36-150 Air supply. (1) **Clean air.** Compressed air supplied to working area shall not contain quantities of harmful or offensive air contaminants exceeding the limits set forth hereinbefore.

(2) **Amount.** Nor less than 30 cubic feet per minute per man, measured at the prevailing working chamber pressure, of outside air shall be supplied to the working areas under pressure.

(3) **Supply lines.** In addition to the compressed air lines supplying working areas under pressure, there shall be a second such line of the same size and similarly equipped which shall be maintained ready for immediate use between the working chamber side of the bulkhead and the compressed air source in case of failure of the first line.

(4) **Point of discharge.** The point of discharge of the supply line in use shall be as close to the working face as is practicable and the discharge end of both supply lines shall be provided with a check valve.

(5) **Air outlet or exhaust line.** Air outlet lines from areas under pressure shall be properly located so that injurious gases may be promptly removed. Such lines shall be provided with suitable valves.

(6) **Air tools.** The high pressure air supplied for air-operated tools, equipment and appliances shall comply with the quality requirements contained in WAC 296-36-145, Air quality in working areas.

[Rules (Part VIII), filed 12/28/62; Rule 2009, filed 3/23/60.]

WAC 296-36-155 Compressor plant. (1) **Capacity.**

The capacity, arrangement and number of compressors shall be sufficient to maintain the necessary pressure without overloading the equipment and to assure maintenance of such pressure in the working chamber during periods of breakdown or other emergency. The compressor installation shall be capable of delivering not less than 50 cubic feet per minute of ventilating air for each man in the working chamber at the prevailing working chamber pressure. Additional stand-by compressor units shall be installed in accordance with the following tabulation:

Normal installation at 50 C.F./Man/Min. units	Stand-by units	Total units	Percent rated total capacity of stand-by units divided by normal units
1	1	2	100
2	2	4	100
3	2	5	67
4	2	6	50
5	2	7	40

(2) **Sources of power.** Where the power is generated on the job there shall be a sufficient number of power units to maintain the necessary compressor operation.

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(3) **Power feeders.** Where power is obtained from a public utility there shall be at least two feeders to the compressor plant. Each feeder shall have a capacity sufficient to carry the entire load and normal overload. The feeders shall run over separate routes in such a way that a breakdown of one feeder will not cause any interruption of power from the other feeder. Each feeder or service extension shall enter the compressor plant through a separate and independent opening.

(4) **Bus bar connections.** There shall be duplicate feeder bus bars at the compressor plant. Feeder connections to the bus bar shall be such that either feeder can feed to each bus bar separately or simultaneously to both bus bars. The electrical connections from the bus bars to the compressor shall be arranged in such a way as to insure continuous operation of the compressor plant, in spite of any breakdown of an individual feeder, bus bar or compressor unit.

(5) **Alternate sources of power.** Any combination of power either generated at the job or generated off the job as set forth above, and which complies with the above requirements is permitted.

(6) **Maintenance.** All equipment including reserve sources of power and reserve compressor equipment used to maintain pressure in working areas shall at all times be maintained in good repair and ready for use. All reserve equipment shall be periodically inspected and shall be operated for a period of one hour or more at least once in every week, except where there is danger of sudden flooding, in which case reserve equipment shall be operated at least one hour in every 24 hours. An ample supply of spare parts shall be kept on hand.

[Rules (Part IX), filed 12/28/62; § 12, filed 3/23/60.]

WAC 296-36-160 Personnel facilities. (1) **General.** There shall be provided on every job a change house which shall have a dressing room and separate spaces for each of the following: drying clothes, shower baths, toilet facilities and rest room with seating facilities and tables.

(2) **Maintenance.** The change house shall be kept clean throughout.

(3) **Dressing room.** The dressing room shall be provided with benches and a full length metal or other approved non-combustible locker with facilities for locking for each compressed air worker.

(4) **Clothes drying.** Facilities for drying clothing shall be installed and sufficient heat shall be provided to dry the clothing within 12 hours.

(5) **Toilet facilities.** One toilet and one urinal shall be provided for every 8 men or part thereof employed on each shift.

(6) **Shower baths.** Shower baths with hot and cold water shall be installed in the change house in sufficient number to provide one unit for every 8 men coming off shift.

(7) **Wash basins.** At least one wash basin with hot and cold running water or equivalent facilities at wash fountains shall be provided for every 8 men coming off shift.

(8) **Temperature.** A minimum temperature of 72 degrees F. shall be maintained in the dressing room, wash room and bathroom.

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(9) **Coffee.** A sufficient supply of hot coffee, cream, milk and sugar shall be supplied to men working in compressed air at the termination of shifts and during rest periods. Coffee shall be heated by means other than direct steam. Coffee containers shall be kept clean and covered. Unless drinking cups are of the single service type, individual cups shall be sterilized after each use.

(10) **Eating space underground.**

(a) **General.** Suitable eating space shall be provided in the working chamber in the event that established working periods are of sufficient length to normally include a meal time interval. *Exception:* This requirement is not applicable to caisson work.

(b) **Facilities.**

(i) **Space requirements.** The space provided shall have a minimum head room of 6 feet 6 inches and a minimum area of 6 square feet shall be provided per person occupying the space at any one time.

The area shall be dry and clean, shall be lighted, heated and ventilated in accordance with WAC 296-36-125 (5) and (6), man locks.

(ii) **Equipment.** The space shall be equipped with tables and comfortable seating facilities providing seating space not less than 22 inches in width per occupant; disposable towels; washing facilities with hot and cold water or in lieu thereof acceptable dry-cleansing tissues; and space outside the immediate eating area for the removal and temporary storage of protective clothing. Portable equipment, acceptable to the supervisor of safety, department of labor and industries, which may be moved into the working chamber and removed therefrom, may be provided.

[Rules (Part X), filed 12/28/62; § 21, filed 3/23/60.]

WAC 296-36-165 Sanitation below ground. (1) **Toilet facilities.** At least one approved chemical toilet shall be provided in the working chamber. Such facilities shall be maintained in a sanitary condition and shall be used by the workers.

(2) **Housekeeping.** No refuse or discarded material of any kind shall be permitted to accumulate underground. The man lock shall be kept clean.

(3) **Drinking water.** An ample supply of clean and potable drinking water shall at all times be available in working areas. Where water is supplied in containers it shall be kept covered. The use of common drinking cups is prohibited.

[Rules (Part XI), filed 12/28/62; § 21, filed 3/23/60.]

WAC 296-36-170 Stairs and ladders. The requirements of chapter 296-155 WAC Parts K and J shall apply.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-36-170, filed 8/13/90, effective 9/24/90; Rules (Part XII), filed 12/28/62.]

WAC 296-36-175 Lighting and power equipment. (1) **All lighting underground shall be by electricity.**

(a) **Lighting** shall comply with chapter 296-155 WAC.

(b) **Power equipment** shall comply with chapter 296-155 WAC.

[Title 296 WAC—p. 1059]

(2) **Emergency lighting.** The lighting circuits shall be connected to two independent sources of power supply. In addition to the lighting circuit, adequate and sufficient portable electric emergency lights shall be provided and maintained for immediate use. These shall be readily accessible to all employees working underground.

(3) **Lamp sockets.** The exterior of all lamp sockets shall be of nonmetallic material and all sockets shall be of the weatherproof type.

(4) **Location of lamps.** Lamps shall be so placed that they cannot come into contact with combustible materials and so that a clear space is provided all around.

(5) **Lamp guards.** All lamps shall be protected with wire cage guards.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-36-175, filed 8/13/90, effective 9/24/90; Rules (Part XIII), filed 12/28/62; § 6, filed 3/23/60.]

WAC 296-36-180 Signals and means of communication. (1) Effective and reliable signaling devices shall be maintained at all times to give instant communication between the bottom and top of shaft, and where considered necessary by the safety division, dual independent signal systems shall be installed.

(2) Special care shall be taken to keep the signaling apparatus in good order, and all proper precautions shall be taken to prevent electric signal and telephone wires from coming into contact with other electric conductors, whether insulated or not.

(3) Where it is necessary to use signals by means of bell or otherwise for hoisting or lowering, the following code shall be used:

Any code of signals used shall be printed and copies thereof shall be kept posted in a conspicuous place near entrances to work places and in such other places as may be necessary to bring them to the attention of all persons concerned.

1 bell:	Stop immediately if in motion.
2 bells:	Lower.
3-1 bells:	Hoisting men, run slowly.
3-2 bells:	Lowering men.
1-1 bells:	To hoist muck.
2-1-2 bells:	Release cage, skip, or bucket.
4 slow bells:	Blasting signal. (This is a caution signal and if the hoist operator is prepared to accept it he must acknowledge it by raising cage, skip or bucket a few feet then lowering it again. After accepting this signal, hoist operator must be prepared to hoist men away from blast as soon as signal 3-1 bells are given and must accept no other signal in the meantime.)
5 bells:	Water on or off.
6 bells:	Air on or off.

9 bells: Danger signal (fire, accident or other danger), followed by station signal, calls cage, skip, or bucket to that station. This signal takes precedence over all others except an accepted blasting signal.

(4) Where tunnels are driven from shafts more than two hundred fifty feet deep, a telephone system shall be established and maintained, communicating with the surface at each such shaft, and with a station or stations readily and quickly accessible to the men at the working level.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-36-180, filed 8/13/90, effective 9/24/90; Rules (Part XIV), filed 12/28/62.]

WAC 296-36-185 Explosives—Blasting. (1) **Storage and supply.** Explosives including detonators shall not be stored or kept underground. The supply for each blast shall be taken directly from above ground to the face and immediately loaded. All explosives remaining after loading a round shall be removed to the magazine before the leading wires are connected.

(2) **Explosives in air locks.** While explosives are being locked through a tunnel bulkhead, the detonators and explosives shall be placed at the opposite ends of the lock and no person, other than the lock tender and those persons necessary for carrying, shall be permitted in the lock. No other material or equipment shall be locked through with explosives.

Explosives and detonators shall be taken separately into caissons.

(3) **Carrying containers.** Explosives other than detonators shall be conveyed in a suitable covered wooden box painted red and provided with handles. Detonators shall be conveyed in a separate covered wooden box, painted red with a one-inch yellow stripe running horizontally entirely around the box. The box shall be provided with handles.

(4) **Blaster.** The blaster shall be a person designated by the superintendent and shall be in charge of all operations connected with preparations for blasting and shall fire all shots.

(5) **Duties of the blaster.** Before removing any explosives from the carrying containers, the blaster shall verify

(a) That the blasting switch is in "off" position and that its box is locked;

(b) That the "gap" in the blasting circuit is open; (Note: A gap of at least 5 feet on the incoming side of the switch, except during the firing operation, when connections at such gap are to be made by means of plugs, is required.)

(c) That the heading gang has been withdrawn to a safe distance or to a safe shelter, except such men from the gang as the blaster may direct to remain with him to assist in loading under his directions; and

(d) That all light and power circuits have been disconnected at a point not less than 100 feet from the place to be blasted. The blaster shall direct the loading of all holes and the making of the necessary connections in the blasting circuit; he shall sound a warning signal distinctly audible in any part of the working chamber, shield or any drift ahead of the

shield where any person remaining would be exposed to injury from the blast.

(6) **Vacating blasting area.** All persons shall promptly vacate the blasting area when so directed by the blaster. When the blaster is satisfied that all persons have vacated the blasting area, he, alone, shall unlock the box that contains the blasting switch and fire the blast.

(7) **Return to blasting area.** No person shall return to the blasting area until the air in such area has been cleared of injurious concentrations of toxic fumes. The blaster shall be the first to return to the heading. He shall examine the effects of the blast and investigate the matter of possible misfires and he, alone, shall give the signal for the return of the workmen to the heading and for the restoration of light and power in the blasted area.

(8) **Hand lamps and cap lamps.** Electric hand lamps and cap lamps used by the blaster or his helpers or by any other person in the working chamber during the blasting operation shall be approved.

(9) **Blasting circuits.** All circuits used for blasting shall be ungrounded circuits. Damaged leading wires shall not be used.

[Rules (Part XV), filed 12/28/62; § 14, filed 3/23/60.]

WAC 296-36-190 Fire prevention and fire fighting.

(1) **General.** Every building and every flammable structure above ground and all places underground shall be within easy range of fire fighting equipment, which shall at all times be maintained in proper working conditions and ready for use.

(2) **Smoking.** No person shall smoke or carry lighted smoking materials in compressed air. No matches, mechanical or chemical igniters will be permitted in the working chamber except those necessary for welding or flame cutting operations.

(3) **Welding or flame cutting.** While welding or flame cutting is being done in compressed air, a watchman with a fire hose or approved extinguisher shall stand by until such operation is completed. Acetylene shall not be used in compressed air at acetylene pressure exceeding 15 pounds per square inch gage, or 30 pounds per square inch absolute.

(4) **Fire hose.** Fire hose shall be at least 1-1/2 inches in nominal diameter; the water pressure shall at all times be adequate for efficient operation of the type of nozzle used; and the water supply shall be such as to insure an uninterrupted flow. Fire hose when not in use shall be so located or guarded to prevent injury thereto.

Every power house, compressor house and every building housing ventilating equipment shall be provided with at least one hose connection in the water line with the fire hose connected thereto. A fire hose shall be maintained within easy reach of structures of wood over or near shafts.

(5) **Shafts and caissons.** Every shaft and every caisson containing flammable material of any kind, either above or below ground, shall be provided with a water line and a fire hose connected thereto, so arranged that all points of the shaft or caisson are within easy reach of the hose stream.

(6) **Tunnels.** Every tunnel shall be provided with a water line extending into the working chamber and to within 100 feet of the working face. Such lines shall have hose outlets

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with 100 feet of fire hose properly attached and maintained as follows: One at the working face, one immediately inside of the bulkhead of the working chamber, and one immediately outside such bulkhead. In addition, hose outlets shall be provided at 200-foot intervals throughout the length of the tunnel and 100 feet of fire hose shall be attached to the outlet nearest to any location where flammable material is being kept or stored or where any flame is being used.

(7) **Fire extinguishers.** In addition to required fire hose protection, on every floor of every building used in connection with compressed air work, there shall be provided at least one extinguisher of adequate size approved for the class of hazard involved, except that extinguishers containing carbon tetrachloride or methyl bromide shall not be used. Extinguishers shall be so located as to be readily available and protected from damage.

[Rules (Part XVI), filed 12/28/62; § 7, filed 3/23/60.]

WAC 296-36-195 Special provisions for tunnels. (1) **Bulkheads.** The bulkheads separating the working chamber from areas of lower pressure shall be of sufficient strength to withstand safely the maximum pressure to which it may be subjected. Where there is a possibility of rapid flooding of the working chamber, such as might be present in subaqueous tunnels, the bulkhead shall be located sufficiently close to the face or shield to permit escape of the workers in case of an emergency. But in no case where there is such possibility shall such distance be more than 300 feet.

(2) **Safety curtain or screens.** Where danger of a blow or an in-rush of water exists in tunnels 12 feet or more in clear height, and the elevation of the top of the lining at the face and of the completed tunnel back to the emergency lock are such that a safety curtain will afford protection to the workman, a safety curtain shall be provided. It shall be located where it will afford the maximum of protection in case of an emergency but not impracticably close to the face.

Safety curtains shall be of incombustible material and shall be installed in the crown of the tunnel. They shall provide an airtight seal with the tunnel lining and shall be properly reinforced and braced as may be necessary. Curtains or screens shall be installed at right angles to the axis of the tunnel with the bottom edge horizontal. In tunnels up to and including 24 feet in inside clear height, the safety curtain shall extend down to the center line of the tunnel. In tunnels over 24 feet inside clear height, it shall extend at least 12 feet below the inside clearance line of the roof of the tunnel.

(3) **Walkways.** In tunnels 16 feet or more in diameter, containing safety curtains or screens, hanging walkways shall be provided from the face to the man lock and shall be installed as high in the tunnel as is practicable. Such walkway shall be installed above the tunnel floor and shall have at least 6 feet of head room above the walkway. A railing 42 inches high and a toe board shall be securely installed throughout the length of walkways on open sides. In areas under pressure, the walkways, stairways, and ladders including railings shall be of incombustible material.

(4) **Maintenance of walkways.** Walkways and the stairs or ladders leading thereto shall be at all times maintained

clear, in good repair, and in a condition to carry safely the loads to which they may be subjected.

(5) **Ramps.** Walkways shall be provided with ramps under safety screens. Such ramps shall be provided with cleats.

(6) **Man lock and material lock.** Every tunnel shall have at least two locks in proper working condition, one of which shall be used as a material and equipment lock and the other used exclusively as a man lock.

(7) **Emergency man lock.** In subaqueous tunnels where space permits, there shall be in addition to the man lock and the material lock, an emergency man lock which shall be large enough to hold an entire heading shift and which shall be kept open toward the face and maintained ready for use at all times.

(8) **Location of locks.** Man locks and emergency locks shall be located as high in the tunnel as space will permit but the emergency lock shall be located in the crown of the tunnel.

(9) **Track safeties and brakes.** An automatic stop block or derailing device shall be provided at the top of every slope or incline greater than 3 percent. In addition, such a device shall be installed at a point not less than 150 feet nor more than 200 feet up grade from any point where runaway cars may cause damage to the shield or air lock. A holding device shall be provided for cars used on inclines. Such device shall be set in the holding position during loading.

[Rules (Part XVII), filed 12/28/62; §§ 10 and 18, filed 3/23/60.]

WAC 296-36-200 Special provisions for caissons. (1)

Number of locks. Every caisson shall have at least two locks, one of which shall be used exclusively as a man lock. *Exception:* Caissons having a working area less than 150 square feet may have a single or combined man and material lock.

(2) **Location of man locks.** The bottom of the lowest door opening of locks shall not be less than 3 feet above the water level being controlled by the use of compressed air.

(3) **Lock platforms.** All caisson locks located above ground shall be provided with an exterior platform not less than 42 inches wide with stairs or ladders leading thereto. The platform and stairs shall have a substantial handrail with midrail and the platform shall have toeboards at least 4 inches high.

(4) **Ladderways and stairways in man shafts or shafting.** Ladderways or stairways shall be provided and shall be kept clear and in good condition. Stairways shall be lighted at every landing and ladderways shall be lighted at 10-foot intervals with guarded incandescent lamps. Ladders and landings shall be of incombustible material. Pockets in the wall of the shaft shall not be used in lieu of ladders. In caissons having a working area more than 150 square feet, the man shafts shall be separated from the hoisting shaft by a barrier. Where the man shaft is separated from the hoisting shaft, the ladderways shall be provided with platform landings at intervals not exceeding 15 feet. In caissons having a working area less than 150 square feet, the ladder shall be recessed to prevent interference between the bucket and the ladder.

(5) **Hoisting.** No person shall ride on a loaded car, cage or bucket. Where the ladderway and hoistway are not sepa-

rated by a barrier, no hoisting shall be done while any person is ascending or descending the ladder, nor shall any person enter the shaft while the hoisting conveyance is in motion. Standard warning signals shall be provided and shall be given and acknowledged to affect compliance with this provision.

(6) **Shoring.** Where the bottom of the excavation is below the cutting edge of the caisson and there is danger of a cave-in, the sides of the excavation shall be securely shored.

[Rules (Part XVIII), filed 12/28/62; § 17, filed 3/23/60.]

WAC 296-36-210 Medical supervision and medical and first-aid facilities—Medical supervision. (1)

Appointed physician. Where workmen are employed in compressed air, their employer shall make arrangements for their medical supervision by one or more licensed physicians trained in the physical requirements and the medical aspects of compressed air work and the treatment of decompression illness. The employer shall arrange for medical examination of all workmen employed in compressed air at a suitable place or places by the appointed physician in accordance with these regulations. The appointed physician or physicians shall be immediately available in case of emergency or accident. Each appointed physician shall be physically qualified to subject himself to a compressed air environment.

(2) **Appointed physician's duties and responsibilities.**

(a) General. All matters on the job pertaining to the health of employees, treatment on the job of illness and injuries, special first-aid and nursing personnel or assistants, lock attendants, and medical and first-aid equipment shall be under the supervision of the appointed physician.

(b) He shall make all required physical examinations.

(c) He shall make and sign all required reports of such examinations using the forms provided by the department of labor and industries.

(d) He shall make at least one inspection on the job every day of all treatment records and the required decompression record and he shall inspect or inquire into conditions which may constitute a potential hazard to the health of any employee.

(3) **Certified medical attendant.** There shall be on every job a certified medical attendant trained to the satisfaction of the appointed physician in administering first aid on compressed air jobs, and who shall be in attendance in the first-aid room while work in compressed air is going on and at such other times as the physician may direct. The medical attendant shall be in personal charge of the administration of first aid and such other duties as physician may direct. Under no circumstances shall female medical attendants be subjected to a compressed air environment.

(4) **First-aid personnel.**

(a) The superintendent and every foreman and at least one additional designated person on each shift below ground shall be trained to the satisfaction of the appointed physician in administering first aid.

(b) Where more than 10 but less than 50 men are employed per shift underground, there shall be at least 2 such additional designated trained persons on the job and available on call.

(c) Where more than 50 men are employed per shift underground, the designated trained personnel shall include all shift bosses and time keepers in addition to those required in subsection (b) above.

(d) All designated first-aid personnel must have in their possession current first-aid certificates that meet certificate requirements stated in chapter 296-24 WAC, Part A-1.

(5) **First-aid meetings.** All designated first-aid personnel shall meet at least once in each 3 months or oftener if directed by the physician for further first-aid instruction by the physician.

(6) **First-aid room and equipment.** The employer must provide a first-aid room properly heated and maintained within 100 yards of the principal entrance to the underground work. It must be equipped with a first-aid kit, medical supplies and equipment consisting of not less than the minimum requirements listed in chapter 296-24 WAC, Part A-1.

(7) **First-aid equipment underground.** All the equipment and supplies which the appointed physician may deem necessary for first-aid underground shall be provided and maintained readily available in a suitable cabinet or cabinets. A list of the contents signed by the appointed physician shall be permanently attached to the inside of the cabinet door or cover. The cabinet shall be plainly marked with a red cross and the words "first aid."

In caissons, one such cabinet shall be conveniently located in the working chamber.

In tunnels where a bulkhead is installed, one such cabinet shall be located on each side of the bulkhead near the entrance to the man lock.

In tunnels having no bulkhead, one such cabinet shall be located within 100 yards of the working face.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 00-01-038, § 296-36-210, filed 12/7/99, effective 2/1/00. Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-36-210, filed 8/13/90, effective 9/24/90; Rules (Part XIX A), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-215 Medical supervision and medical and first-aid facilities—Medical locks. (1) **Requirement and location.** When the pressure in a working chamber exceeds 13 pounds per square inch gage, a suitably constructed medical lock shall be provided and maintained and used solely for the treatment and examination of workmen working in compressed air. It shall be situated adjacent to a medical emergency room but separated therefrom to provide privacy for patient and doctor during treatment or examination.

(2) **Design and equipment.**

(a) The medical lock shall have not less than 6 feet of clear head room and shall consist of not less than two compartments so that the lock can be entered while under pressure. It shall be adequately ventilated, air conditioned, heated and lighted and be constructed and finished as to be readily kept in a clean and sanitary condition.

(b) The medical lock shall be designed for an operating pressure of 75 pounds per square inch gage pressure.

(c) It shall be equipped with pressure gages readily observed from inside and outside of the medical lock indicating the pressure on the inside of the lock.

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(d) The air line supplying the medical lock shall be equipped with valves so arranged that the pressure may be controlled from inside or outside the lock.

(e) Oxygen inhalation apparatus shall at all times be maintained ready for use in the lock, but the source of supply shall be located outside of the lock. Oxygen and oxy-helium mixtures shall not be used until proper diagnosis is made by the appointed physician and shall be used only under his direction and supervision. The air compressing plant used for supplying compressed air to the medical lock shall have sufficient capacity to raise the pressure in the medical lock from zero pounds to 75 pounds per square inch gage within 5 minutes and shall be equipped to prevent excessively high temperature within the lock. The temperature within the lock shall not exceed 90 degrees F. at 75 pounds per square inch gage pressure.

(f) The medical lock shall be provided with suitable equipment including a couch not less than 6 feet in length, blankets, food lock, efficient means of verbal communication and of giving nonverbal signals between the inside and outside of the lock, and between the two compartments, and a window or windows through which workmen in either compartment can be observed from outside. Telephone communications shall be provided between the inside and outside of the medical lock. The telephone circuits shall, however, be so arranged that completion of calls originating inside the lock and destined for subscribers of the commercial communication system or calls the origin of which is from a subscriber of the commercial communication system and destined for the medical lock, must be completed by the lock attendant.

(g) All necessary apparatus, instruments, medical supplies and equipment as required by the appointed physician shall be kept in the lock at all times.

(3) **Use of medical lock.**

(a) The medical lock shall be kept ready for immediate use and, when any workman is actually employed in compressed air, shall be constantly in charge of a person trained in the use of a medical lock and suitably instructed as to the steps to be taken in the event of any workman suffering ill effects from compressed air.

(b) No workman shall enter or be treated in the medical lock in which pressure exists except at the direction of the appointed physician for the purpose of examination as to medical fitness or for the purpose of diagnosis of a suspected illness, or for treatment of the condition diagnosed by the appointed physician.

[Rules (Part XIX B), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-220 Medical supervision and medical and first-aid facilities—Decompression illness—Symptoms and treatment. Every compressed air worker, upon noticing any symptom of decompression illness and wherever he may be, on the job or off the job, shall proceed immediately to the first-aid room for examination and treatment. Treatment shall be rendered promptly as directed by the appointed physician. Recompression, if prescribed by the appointed physician, shall be as the appointed physician may direct. After such treatment, the worker shall return to work only as and when directed by the physician.

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[Rules (Part XIX C), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-225 Medical supervision and medical and first-aid facilities—Decompression illness to be reported. Every case of decompression illness shall be reported by the physician to the _____. Distribution of the report shall be as directed by the _____. Responsibility for supervision of treatment and accuracy of the report shall rest with the physician.

[Rules (Part XIX D), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-250 Routine examination of employees—Preemployment examinations and reports. (1) Every person considered for work in compressed air on any job and before starting work shall be given a thorough medical and physical examination by the appointed physician who shall order special tests when deemed necessary. The physician's findings shall be entered on a form entitled "preemployment history" and a form entitled "physical examination" furnished by the department of labor and industries. A copy of his recommendation as to employability shall be submitted to the superintendent and shall be kept on the job. The physical examination shall include adequate X-rays to determine possible preexisting lung or bone disease, a test of the ability of the ear to adjust to pressure changes, an orthopedic examination, a clear tone audiogram, an inspection for gross obesity, a simple test for pulmonary and cardiac function, and an inquiry concerning metallic objects in the body.

(2) No workman shall be employed in compressed air unless he has been examined by the appointed physician and is certified by the physician, by a health certificate or a workman's compressed air health register, to be fit for such employment, and further that the date of such certificate is not more than 3 days earlier.

(3) Where work in compressed air is urgently required to be done, before it is reasonably practical, because of the inaccessibility of the appointed physician, to arrange for any examination to obtain any certificate required, an examination may be made by any duly qualified physician who may issue a temporary certificate of fitness. A reexamination of such a workman by the appointed physician shall be made as soon as practicable.

[Rules (Part XX A), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-255 Routine examination of employees—Beginners. Every person who has not previously worked in compressed air shall be tested in the medical lock as part of the preemployment examination before commencing such work. If he passes the test he shall not work more than 4 hours on his first day of work or not more than one-half the regular total work period whichever is the lesser in time, after which he shall be reexamined by the physician for physical fitness. The physician's recommendation shall be in writing and signed by him. A copy shall be submitted to the employer and shall be kept on the job.

[Rules (Part XX B), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-260 Routine examination of employees—Periodic examination. Every compressed air worker

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shall be examined at regular intervals to determine his fitness to continue work in compressed air. The interval between regular examinations shall not exceed 2 months when work pressures are 13 pounds or less. For pressures exceeding 13 pounds, the regular periodic examination shall be made at intervals not exceeding one month.

[Rules (Part XX C), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-265 Routine examination of employees—Resumption of work. (1) Every compressed air worker who has been absent from the job 10 days or more shall be examined by the physician before resuming work. The physician's findings shall be submitted in writing to the person in charge and shall be kept on the job.

(2) Any workman who is suffering from a cold in the head, a sore throat, ear ache, or any other ailment which is likely to render him unfit for employment in compressed air shall report the matter to his employer or to the person placed in charge of the operation or to the appointed physician, and he shall not be employed in compressed air until he has since, so reporting, been examined by the appointed physician and certified by him to be fit for such employment.

(3) The appointed physician may, on examining or reexamining a person who has been or who is proposed to be employed in compressed air, vary, qualify, or revoke, by written entry in the workman's certificate, any statement relative to his fitness for employment in compressed air. By the same process, the physician may limit the pressure to which the workman is to be subjected or restrict the hours of employment or exposure in compressed air.

[Rules (Part XX D), filed 12/28/62; § 23, filed 3/23/60.]

WAC 296-36-270 Routine examination of employees—Physical fitness requirements. (1) Only persons who are able to readily equalize the pressure in their ears shall be accepted for work in compressed air.

(2) Persons having chronic alcoholism shall not be permitted to work in compressed air.

(3) Persons having chronic systemic disease or any impairing physical deformity or abnormality including excessive obesity shall not be engaged for work in compressed air.

(4) Persons having any disease of the ear or any systemic disease including skeletal, cardio-vascular, respiratory, genital urinary, or gastrointestinal, which may be aggravated by work in compressed air or which may prevent safe performance of such work, shall not be permitted to work in compressed air.

(5) A person engaged for work in compressed air shall demonstrate his ability to read, speak and comprehend the English language.

[Rules (Part XX E), filed 12/28/62.]

WAC 296-36-990 Severability. If any provision of this safety standard or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of this safety standard which can be given effect without the invalid provisions or applica-

tions and to this end the provision of this safety standard are declared to be severable.

[Rules (Part XXI), filed 12/28/62.]

Chapter 296-37 WAC

STANDARDS FOR COMMERCIAL DIVING OPERATIONS

WAC

296-37-510	Scope and application.
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296-37-590	Appendix B to chapter 296-37 WAC—Guidelines for scientific diving.

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-37-010	Scope and application. [Section I, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-081	Form # 3. [Form # 3, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-020	Purpose. [Section II, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-082	Illustrations of flags and shapes. [Illustrations, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-030	Definitions. [Section III, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-090	Recompression chamber—Tables—Attendant. [Section IX, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-040	Appointment and duties of committees. [Section IV, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-100	Identification. [Section X, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-050	Classification of apparatus permitted and air purity. [Section V, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-110	Waiver or variance. [Section XI, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-060	Approval of equipment. [Section VI, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-300	Use of compressors in diving operations. [Rule 101, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-070	Diver registration—Diver training or experience—Physical exam and medical history record. [Section VII, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-310	Equipment requirements—Divers air line, check valves, etc. [Rules 102 and 103, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-071	Form # 1. [Form # 1, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-320	Equipment requirements—Barge operations. [Rule 104, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-072	Form # 2. [Form # 2, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-330	Equipment requirements—Air tools used in underwater operations. [Rule 105, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
296-37-080	General requirements, procedures and techniques. [Section VIII, effective 2/1/64.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.	296-37-340	Equipment requirements—Inspection. [Rule 106, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-350	Safety rules—Generally. [Rule 107, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-360	Safety rules—Suggestions made by diver considered rule to govern. [Rule 108, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-370	Conditions on barge deck. [Rule 109, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-380	Use of two-way telephones. [Rule 110, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-390	Decompression chamber—When used. [Rule 111, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-395	Special stipulation regarding inexperienced divers and workmen. [Rule 112, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-400	Special stipulation regarding inexperienced divers and workmen—Diver may choose tender. [Rule 113, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
		296-37-410	Judgment of diver to take precedent. [Rule 114, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040,

- 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
- 296-37-420 Requirement on all ship surveys. [Rule 115, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
- 296-37-430 Use of flood lights. [Rule 116, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
- 296-37-440 Rules for compressed air operations applicable to diving operations. [Rule 117, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
- 296-37-450 Availability of life preservers. [Rule 118, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.
- 296-37-460 Care and replacement of equipment. [Rules 119 and 120, filed 3/23/60.] Repealed by 78-10-094 (Order 78-18), filed 10/2/78. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW.

WAC 296-37-510 Scope and application. (1) The requirements included in this vertical chapter shall apply throughout the state wherever diving takes place within the jurisdiction of the department of labor and industries. These requirements shall also be applicable to those diving related and supportive work activities not at the diving site but which have a direct effect on the safety of the diving operations. Examples may include but are not limited to: The supply of breathing air or gas; the supply of materials, equipment or supplies required by this chapter; the maintenance of diving equipment.

(2) This standard applies to diving and related support operations conducted in connection with all types of work and employments, including general industry, construction, ship repairing, shipbuilding, shipbreaking and longshoring. However, this standard does not apply to any diving operation:

(a) Performed solely for instructional purposes, using open-circuit, compressed-air SCUBA and conducted within the no-decompression limits;

(b) Performed solely for search, rescue, or related public safety purposes by or under the control of a governmental agency; or

(c) Governed by 45 CFR Part 46 (Protection of Human Subjects, United States Department of Health and Human Services) or equivalent rules or regulations established by another federal agency, which regulate research, development, or related purposes involving human subjects.

(d) Defined as scientific diving and which is under the direction and control of a diving program containing at least the following elements:

(i) Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.

(ii) Diving control (safety) board, with the majority of its members being active divers, which shall at a minimum have the authority to: Approve and monitor diving projects; review and revise the diving safety manual; assure compliance with the manual; certify the depths to which a diver has

been trained; take disciplinary action for unsafe practices; and, assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for SCUBA diving.

(3) This chapter shall augment the requirements of the general safety and health standard, chapter 296-24 WAC and the general occupational health standard, chapter 296-62 WAC. In instances where this chapter is in direct conflict with the requirements of any general horizontal standard, the requirements of this chapter shall apply.

(4) Hoisting gear used in diving operations shall be inspected and certified as required by chapter 296-56 WAC, safety standards for longshore, stevedore and related waterfront operations.

(5) Application in emergencies. An employer may deviate from the requirements of this standard to the extent necessary to prevent or minimize a situation which is likely to cause death, serious physical harm, or major environmental damage, provided that the employer:

(a) Notifies the assistant director of the department of labor and industries in Olympia or the regional administrator for the region within 48 hours of the onset of the emergency situation indicating the nature of the emergency and extent of the deviation from the prescribed regulations; and

(b) Upon request from the authority notified, submits such information in writing.

(6) Employer obligation. The employer shall be responsible for compliance with:

(a) All provisions of this standard of general applicability; and

(b) All requirements pertaining to specific diving modes to the extent diving operations in such modes are conducted.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-37-510, filed 7/20/94, effective 9/20/94. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-510, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 87-02-002 (Order 86-44), § 296-37-510, filed 12/26/86; 81-07-048 (Order 81-4), § 296-37-510, filed 3/17/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-510, filed 10/2/78.]

WAC 296-37-512 Variance and procedure. Realizing that conditions may exist in operations under which certain state standards will not have practical application, the director of the department of labor and industries or his/her authorized representative may, pursuant to this section, RCW 49.17.080 and/or 49.17.090 and appropriate administrative rules of this state and the department of labor and industries and upon receipt of application and after adequate investigation by the department, permit a variation from these requirements when other means of providing an equivalent measure of protection are afforded. Such variation granted shall be limited to the particular case or cases covered in the application for variance and may be revoked for cause. The permit for variance shall be conspicuously posted on the premises and shall remain posted during the time it is in effect. All requests for variances from safety and health standards included in this or any other chapter of Title 296 WAC, shall be made in writing to the director of the department of labor and industries at Olympia, Washington, or his/her duly authorized representative, or the assistant director, Depart-

ment of Labor and Industries, P.O. Box 44600, Olympia, Washington 98504-4600. Variance application forms may be obtained from the department upon request.

[Statutory Authority: Chapter 49.17 RCW, 94-15-096 (Order 94-07), § 296-37-512, filed 7/20/94, effective 9/20/94. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW, 78-10-094 (Order 78-18), § 296-37-512, filed 10/2/78.]

WAC 296-37-515 Definitions. As used in this standard, the listed terms are defined as follows:

- (1) "Acfm": Actual cubic feet per minute.
- (2) "ASME Code or equivalent": ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code, Section VIII, or an equivalent code which the employer can demonstrate to be equally effective.
- (3) "ATA": Atmosphere absolute.
- (4) "Bell": An enclosed compartment, pressurized (closed bell) or unpressurized (open bell), which allows the diver to be transported to and from the underwater work area and which may be used as a temporary refuge during diving operations.
- (5) "Bottom time": The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins ascent.
- (6) "Bursting pressure": The pressure at which a pressure containment device would fail structurally.
- (7) "Cylinder": A pressure vessel for the storage of gases.
- (8) "Recompression/decompression chamber": A pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers and to treat decompression sickness.
- (9) "Decompression sickness": A condition with a variety of symptoms which may result from gas or bubbles in the tissues of divers after pressure reduction.
- (10) "Recompression/decompression table": A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.
- (11) "Dive location": A surface or vessel from which a diving operation is conducted.
- (12) "Dive-location reserve breathing gas": A supply system of air or mixed-gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during the planned decompression.
- (13) "Dive team": Divers and support employees involved in a diving operation, including the designated person-in-charge.
- (14) "Diver": An employee working in water using underwater apparatus which supplies compressed breathing gas at the ambient pressure.
- (15) "Diver-carried reserve breathing gas": A diver-carried supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by a standby diver.
- (16) "Diving mode": A type of diving requiring specific equipment, procedures and techniques (SCUBA, surface-supplied air, or mixed gas).

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(17) "Fsw": Feet of seawater (or equivalent static pressure head).

(18) "Heavy gear": Diver-worn deep-sea dress including helmet, breastplate, dry suit, weighted shoes.

(19) "Hyperbaric conditions": Pressure conditions in excess of surface pressure.

(20) "Inwater stage": A suspended underwater platform which supports a diver in the water.

(21) "Liveboating": The practice of supporting a surface-supplied air or mixed gas diver from a vessel which is underway.

(22) "Mixed-gas diving": A diving mode in which the diver is supplied in the water with a breathing gas other than air.

(23) "No-decompression limits": The depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives," U.S. Navy Diving Manual or equivalent limits which the employer can demonstrate to be equally effective.

(24) "Psi(g)": Pounds per square inch (gauge).

(25) "Scientific diving" means diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as: Placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding; or the use of explosives.

(26) "SCUBA diving": A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

(27) "Standby diver": A diver at the dive location properly equipped and available to assist a diver in the water.

(28) "Surface-supplied air diving": A diving mode in which the diver in the water is supplied from the dive location with compressed air for breathing.

(29) "Treatment table": A depth-time and breathing gas profile designed to treat decompression sickness.

(30) "Umbilical": The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies the diver or bell with breathing gas, communications, power, or heat as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

(31) "Volume tank": A pressure vessel connected to the outlet of a compressor and used as an air reservoir.

(32) "Working pressure": The maximum pressure to which a pressure containment device may be exposed under standard operating conditions.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060, 92-22-067 (Order 92-06), § 296-37-515, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050, 87-02-002 (Order 86-44), § 296-37-515, filed 12/26/86. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW, 78-10-094 (Order 78-18), § 296-37-515, filed 10/2/78.]

WAC 296-37-520 Qualifications of dive team. (1) General.

[Title 296 WAC—p. 1067]

(a) Each dive team member shall have the experience or training necessary to perform assigned tasks in a safe and healthful manner.

(b) Each dive team member shall have experience or training in the following:

- (i) The use of tools, equipment and systems relevant to assigned tasks;
 - (ii) Techniques of the assigned diving mode; and
 - (iii) Diving operations and emergency procedures.
- (c) All dive team members shall be trained in cardiopulmonary resuscitation and first aid (American Red Cross standard course or equivalent).

(d) Dive team members who are exposed to or control the exposure of others to hyperbaric conditions shall be trained in diving-related physics and physiology.

(2) Assignments.

(a) Each dive team member shall be assigned tasks in accordance with the employee's experience or training, except that limited additional tasks may be assigned to an employee undergoing training provided that these tasks are performed under the direct supervision of an experienced dive team member.

(b) The employer shall not require a dive team member to be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.

(c) The employer shall not permit a dive team member to dive or be otherwise exposed to hyperbaric conditions for the duration of any temporary physical impairment or condition which is known to the employer and is likely to affect adversely the safety or health of a dive team member.

(3) Designated person-in-charge.

(a) The employer or an employee designated by the employer shall be at the dive location in charge of all aspects of the diving operation affecting the safety and health of dive team members.

(b) The designated person-in-charge shall have experience and training in the conduct of the assigned diving operation.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-520, filed 10/2/78.]

WAC 296-37-525 Medical requirements. (1) General.

(a) The employer shall determine that dive team members who are, or are likely to be, exposed to hyperbaric conditions are medically fit to perform assigned tasks in a safe and healthful manner.

(b) The employer shall provide each dive team member who is, or is likely to be, exposed to hyperbaric conditions with all medical examinations required by this standard.

(c) All medical examinations required by this standard shall be performed by, or under the direction of, a physician at no cost to the employee.

(2) Frequency of medical examinations. Medical examinations shall be provided:

(a) Prior to initial hyperbaric exposure with the employer, unless an equivalent medical examination has been given within the preceding 12 months and the employer has obtained the results of the examination and an opinion

from the examining physician of the employee's medical fitness to dive or to be otherwise exposed to hyperbaric conditions;

(b) At one year intervals from the date of initial examination or last equivalent examination; and

(c) After an injury or illness requiring hospitalization of more than twenty-four hours.

(3) Information provided to examining physician. The employer shall provide the following information to the examining physician:

(a) A copy of the medical requirements of this standard; and

(b) A summary of the nature and extent of hyperbaric conditions to which the dive team member will be exposed, including diving modes and types of work to be assigned.

(4) Content of medical examinations.

(a) Medical examinations conducted initially and annually shall consist of the following:

- (i) Medical history;
- (ii) Diving-related work history;
- (iii) Basic physical examination;
- (iv) The tests required by Table I; and
- (v) Any additional tests the physician considers necessary.

(b) Medical examinations conducted after an injury or illness requiring hospitalization of more than 24 hours shall be appropriate to the nature and extent of the injury or illness as determined by the examining physician.

TABLE I

TESTS FOR DIVING MEDICAL EXAMINATION

Test	Initial Examination	Annual Reexamination
Chest x-ray	x	
Visual acuity	x	x
Color blindness	x	
EKG: Standard 12L ¹		
Hearing test	x	x
Hematocrit or	x	x
hemoglobin.		
Sickle cell index	x	
White blood count	x	x
Urinalysis	x	x

¹To be given to the employee once, at age 35 or over.

(5) Physician's written report.

(a) After any medical examination required by this standard, the employer shall obtain a written report prepared by the examining physician containing:

- (i) The results of the medical examination; and
- (ii) The examining physician's opinion of the employee's fitness to be exposed to hyperbaric conditions, including any recommended restrictions or limitations to such exposure (see WAC 296-37-585).

(b) The employer shall provide the employee with a copy of the physician's written report.

(6) Determination of employee fitness.

(a) The employer shall determine the extent and nature of the dive team member's fitness to engage in diving or be

otherwise exposed to hyperbaric conditions consistent with the recommendations in the examining physician's report.

(b) If the examining physician has recommended a restriction or limitation on the dive team member's exposure to hyperbaric conditions, and the affected employee does not concur, a second physician selected by the employee shall render a medical opinion on the nature and extent of the restriction or limitation, if any.

(c) If the recommendation of the second opinion differs from that of the examining (first) physician, and if the employer and employee are unable to agree on the nature and extent of the restriction or limitation, an opinion from a third physician selected by the first two physicians shall be obtained. The employer's determination of the dive team member's fitness shall be consistent with the medical opinion of the third physician, unless the employer and employee reach an agreement which is otherwise consistent with the recommendation or opinion of at least two of the physicians involved.

(d) Nothing in this procedure shall be construed to prohibit either a dive team member from accepting, or an employer from offering, an assignment which is otherwise consistent with at least one medical opinion while a final determination on the employee's fitness is pending.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-525, filed 10/2/78.]

WAC 296-37-530 Safe practices manual. (1) General. The employer shall develop and maintain a safe practices manual which shall be made available at the dive location to each dive team member.

(2) Contents.

(a) The safe practices manual shall contain a copy of this standard and the employer's policies for implementing the requirements of this standard.

(b) For each diving mode engaged in, the safe practices manual shall include:

(i) Safety procedures and checklists for diving operations;

(ii) Assignments and responsibilities of the dive team members;

(iii) Equipment procedures and checklists; and

(iv) Emergency procedures for fire, equipment failure, adverse environmental conditions, and medical illness and injury.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-530, filed 10/2/78.]

WAC 296-37-535 Pre-dive procedures. (1) General. The employer shall comply with the following requirements prior to each diving operation, unless otherwise specified.

(2) Emergency aid. A list shall be kept at the dive location of the telephone or call numbers of the following:

(a) An operational decompression chamber (if not at the dive location);

(b) Accessible hospitals;

(c) Available physicians;

(d) Available means of transportation; and

(e) The nearest U.S. Coast Guard Rescue Coordination Center.

(3) First-aid supplies.

(a) A first-aid kit appropriate for the diving operation and approved by a physician shall be available at the dive location.

(b) When used in a decompression chamber or bell, the first-aid kit shall be suitable for use under hyperbaric conditions.

(c) In addition to any other first-aid supplies, an American Red Cross standard first-aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing shall be available at the dive location.

(4) Planning and assessment. Planning of a diving operation shall include an assessment of the safety and health aspects of the following:

(a) Diving mode;

(b) Surface and underwater conditions and hazards;

(c) Breathing gas supply (including reserves);

(d) Thermal protection;

(e) Diving equipment and systems;

(f) Dive team assignments and physical fitness of dive team members (including any impairment known to the employer);

(g) Repetitive dive designation or residual inert gas status of dive team members;

(h) Decompression and treatment procedures (including altitude corrections); and

(i) Emergency procedures.

(5) Hazardous activities. To minimize hazards to the dive team, diving operations shall be coordinated with other activities in the vicinity which are likely to interfere with the diving operation.

(6) Employee briefing.

(a) Dive team members shall be briefed on:

(i) The tasks to be undertaken;

(ii) Safety procedures for the diving mode;

(iii) Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and

(iv) Any modifications to operating procedures necessitated by the specific diving operation.

(b) Prior to making individual dive team member assignments, the employer shall inquire into the dive team member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.

(7) Equipment inspection. The breathing gas supply system including reserve breathing gas supplies, masks, helmets, thermal protection, and bell handling mechanism (when appropriate) shall be inspected prior to each dive.

(8) Warning signal. When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least one meter in height shall be displayed at the dive location in a manner which allows all-round visibility, and shall be illuminated during night diving operations.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-535, filed 10/2/78.]

WAC 296-37-540 Procedures during dive. (1) General. The employer shall comply with the following requirements which are applicable to each diving operation unless otherwise specified.

(2) Water entry and exit.

(a) A means capable of supporting the diver shall be provided for entering and exiting the water.

(b) The means provided for exiting the water shall extend below the water surface.

(c) A means shall be provided to assist an injured diver from the water or into a bell.

(3) Communications.

(a) An operational two-way voice communication system shall be used between:

(i) Each surface-supplied air or mixed-gas diver and a dive team member at the dive location or bell (when provided or required); and

(ii) The bell and the dive location.

(b) An operational, two-way communication system shall be available at the dive location to obtain emergency assistance.

(4) Decompression tables. Decompression, repetitive, and no-decompression tables (as appropriate) shall be at the dive location.

(5) Dive profiles. A depth-time profile, including when appropriate any breathing gas changes, shall be maintained for each diver during the dive including decompression.

(6) Hand-held power tools and equipment.

(a) Hand-held electrical tools and equipment shall be deenergized before being placed into or retrieved from the water.

(b) Hand-held power tools shall not be supplied with power from the dive location until requested by the diver.

(7) Welding and burning.

(a) A current supply switch to interrupt the current flow to the welding or burning electrode shall be:

(i) Tended by a dive team member in voice communication with the diver performing the welding or burning; and

(ii) Kept in the open position except when the diver is welding or burning.

(b) The welding machine frame shall be grounded.

(c) Welding and burning cables, electrode holders, and connections shall be capable of carrying the maximum current required by the work, and shall be properly insulated.

(d) Insulated gloves shall be provided to divers performing welding and burning operations.

(e) Prior to welding or burning on closed compartments, structures or pipes, which contain a flammable vapor or in which a flammable vapor may be generated by the work, they shall be vented, flooded, or purged with a mixture of gases which will not support combustion.

(8) Explosives.

(a) Employers shall transport, store, and use explosives in accordance with this section and applicable provisions of chapter 296-52 WAC.

(b) Electrical continuity of explosive circuits shall not be tested until the diver is out of the water.

(c) Explosives shall not be detonated while the diver is in the water.

(9) Termination of dive. The working interval of a dive shall be terminated when:

(a) A diver requests termination;

(b) A diver fails to respond correctly to communications or signals from a dive team member;

(c) Communications are lost and can not be quickly reestablished between the diver and a dive team member at the dive location, and between the designated person-in-charge and the person controlling the vessel in liveboating operations; or

(d) A diver begins to use diver-carried reserve breathing gas or the dive-location reserve breathing gas.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-540, filed 10/2/78.]

WAC 296-37-545 Postdive procedures. (1) General. The employer shall comply with the following requirements which are applicable after each diving operation, unless otherwise specified.

(2) Precautions.

(a) After the completion of any dive, the employer shall:

(i) Check the physical condition of the diver;

(ii) Instruct the diver to report any physical problems or adverse physiological effects including symptoms of decompression sickness;

(iii) Advise the diver of the location of a decompression chamber which is ready for use; and

(iv) Alert the diver to the potential hazards of flying after diving.

(b) For any dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas as a breathing mixture, the employer shall instruct the diver to remain awake and in the vicinity of the decompression chamber which is at the dive location for at least one hour after the dive (including decompression or treatment as appropriate).

(3) Recompression capability.

(a) A decompression chamber capable of recompressing the diver at the surface to a minimum of 165 fsw (6 ATA) shall be available at the dive location for:

(i) Surface-supplied air diving to depths deeper than 100 fsw and shallower than 220 fsw;

(ii) Mixed gas diving shallower than 300 fsw; or

(iii) Diving outside the no-decompression limits shallower than 300 fsw.

(b) A decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive shall be available at the dive location for dives deeper than 300 fsw.

(c) The decompression chamber shall be:

(i) Dual-lock;

(ii) Multiplace; and

(iii) Located within five minutes of the dive location.

(d) The decompression chamber shall be equipped with:

(i) A pressure gauge for each pressurized compartment designed for human occupancy;

(ii) A built-in-breathing-system with a minimum of one mask per occupant;

(iii) A two-way voice communication system between occupants and a dive team member at the dive location;

- (iv) A viewport; and
- (v) Illumination capability to light the interior.

(e) Treatment tables, treatment gas appropriate to the diving mode, and sufficient gas to conduct treatment shall be available at the dive location.

(f) A dive team member shall be available at the dive location during and for at least one hour after the dive to operate the decompression chamber (when required or provided).

(4) Record of dive.

(a) The following information shall be recorded and maintained for each diving operation:

- (i) Names of dive team members including designated person-in-charge;
- (ii) Date, time, and location;
- (iii) Diving modes used;
- (iv) General nature of work performed;
- (v) Approximate underwater and surface conditions (visibility, water temperature and current); and
- (vi) Maximum depth and bottom time for each diver.

(b) For each dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas, the following additional information shall be recorded and maintained:

- (i) Depth-time and breathing gas profiles;
- (ii) Decompression table designation (including modification); and
- (iii) Elapsed time since last pressure exposure if less than 24 hours or repetitive dive designation for each diver.

(c) For each dive in which decompression sickness is suspected or symptoms are evident, the following additional information shall be recorded and maintained:

- (i) Description of decompression sickness symptoms (including depth and time of onset); and
- (ii) Description and results of treatment.

(5) Decompression procedure assessment. The employer shall:

(a) Investigate and evaluate each incident of decompression sickness based on the recorded information, consideration of the past performance of decompression table used, and individual susceptibility;

(b) Take appropriate corrective action to reduce the probability of recurrence of decompression sickness; and

(c) Prepare a written evaluation of the decompression procedure assessment, including any corrective action taken, within 45 days of the incident of decompression sickness.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-545, filed 10/2/78.]

WAC 296-37-550 Scuba diving. (1) General. Employers engaged in scuba diving shall comply with the following requirements, unless otherwise specified.

(2) Limits. SCUBA diving shall not be conducted:

- (a) At depths deeper than 130 fsw;
- (b) At depths deeper than 100 fsw or outside the no-decompression limits unless a decompression chamber is ready for use;
- (c) Against currents exceeding one knot unless line-tended; or
- (d) In enclosed or physically confining spaces unless line-tended.

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(3) Procedures.

(a) A standby diver shall be available while a diver is in the water.

(b) A diver shall be line-tended from the surface, or accompanied by another diver in the water in continuous visual contact during the diving operations.

(c) A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces and shall have positive means of communication with the diver or divers within the space.

(d) A diver-carried reserve breathing gas supply shall be provided for each diver consisting of:

- (i) A manual reserve (J valve); or
- (ii) An independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.

(e) The valve of the reserve breathing gas supply shall be in the closed position prior to the dive.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-550, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 81-07-048 (Order 81-4), § 296-37-550, filed 3/17/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-550, filed 10/2/78.]

WAC 296-37-555 Surface-supplied air diving. (1) General. Employers engaged in surface-supplied air diving shall comply with the following requirements, unless otherwise specified.

(2) Limits.

(a) Surface-supplied air diving shall not be conducted at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw.

(b) A decompression chamber shall be ready for use at the dive location for any dive outside the no-decompression limits or deeper than 100 fsw.

(c) A bell shall be used for dives with an inwater decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces.

(3) Procedures.

(a) Each diver shall be continuously tended while in the water.

(b) A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

(c) Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.

(d) For dives deeper than 100 fsw or outside the no-decompression limits:

- (i) A separate dive team member shall tend each diver in the water;
- (ii) A standby diver shall be available while a diver is in the water;
- (iii) A diver-carried reserve breathing gas supply shall be provided for each diver except when heavy gear is worn; and
- (iv) A dive-location reserve breathing gas supply shall be provided.

(e) For heavy-gear diving deeper than 100 fsw or outside the no-decompression limits:

(i) An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver.

(ii) An inwater stage shall be provided to divers in the water.

(f) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided whenever the diver is prevented by the configuration of the dive area from ascending directly to the surface.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-555, filed 10/2/78.]

WAC 296-37-560 Mixed-gas diving. (1) General. Employers engaged in mixed-gas diving shall comply with the following requirements, unless otherwise specified.

(2) Limits. Mixed-gas diving shall be conducted only when:

(a) A decompression chamber is ready for use at the dive location; and

(b) A bell is used at depths greater than 220 fsw or when the dive involves inwater decompression time of greater than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces; or

(c) A closed bell is used at depths greater than 300 fsw, except when diving is conducted in physically confining spaces.

(3) Procedures.

(a) A separate dive team member shall tend each diver in the water.

(b) A standby diver shall be available while a diver is in the water.

(c) A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

(d) Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.

(e) Each diving operation shall have a dive-location reserve breathing gas supply.

(f) When heavy gear is worn:

(i) An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver; and

(ii) An inwater stage shall be provided to divers in the water.

(g) An inwater stage shall be provided for divers without access to a bell for dives deeper than 100 fsw or outside the no-decompression limits.

(h) When a closed bell is used, one dive team member in the bell shall be available and tend the diver in the water.

(i) Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided for each diver:

(i) Diving deeper than 100 fsw or outside the no-decompression limits; or

(ii) Prevented by the configuration of the dive area from directly ascending to the surface.

[Title 296 WAC—p. 1072]

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-560, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-560, filed 10/2/78.]

WAC 296-37-565 Liveboating. (1) General. Employers engaged in diving operations involving liveboating shall comply with the following requirements.

(2) Limits. Diving operations involving liveboating shall not be conducted:

(a) With an inwater decompression time of greater than 120 minutes;

(b) Using surface-supplied air at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw;

(c) Using mixed gas at depths greater than 220 fsw;

(d) In rough seas which significantly impede diver mobility or work function; or

(e) In other than daylight hours.

(3) Procedures.

(a) The propeller of the vessel shall be stopped before the diver enters or exits the water.

(b) A device shall be used which minimizes the possibility of entanglement of the diver's hose in the propeller of the vessel.

(c) Two-way voice communication between the designated person-in-charge and the person controlling the vessel shall be available while the diver is in the water.

(d) A standby diver shall be available while a diver is in the water.

(e) A diver-carried reserve breathing gas supply shall be carried by each diver engaged in liveboating operations.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-565, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 87-02-002 (Order 86-44), § 296-37-565, filed 12/26/86. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-565, filed 10/2/78.]

WAC 296-37-570 Equipment. (1) General.

(a) All employers shall comply with the following requirements, unless otherwise specified.

(b) Each equipment modification, repair, test, calibration or maintenance service shall be recorded by means of a tagging or logging system, and include the date and nature of work performed, and the name or initials of the person performing the work.

(2) Air compressor system.

(a) Compressors used to supply air to the diver shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.

(b) A compressor shall be constructed and situated so as to avoid entry of contaminated air into the air-supply system and shall be equipped with a suitable in-line particulate filter followed by a bed of activated charcoal and, if necessary, a moisture absorber to further assure breathing air quality. These filters should be placed before any receiver and after the discharge in the compressor. If an oil-lubricated compressor is used, it shall be equipped with a carbon monoxide

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alarm or an equally as effective alternative if approved by the department.

(i) If a carbon monoxide alarm is used, it shall be calibrated to activate at or below 20 parts per million carbon monoxide at least once per month. A calibration and maintenance log shall be kept and shall be available for review and copying by the director or his or her designee. The log shall identify the test method, date, time of test, results, and the name of the person performing the test. The log shall be retained for at least one year from the date of the test.

(ii) If the use of an alarm at the compressor will not effectively provide warning to the diver or tender of a carbon monoxide problem, a remote alarm or other means of warning the wearer shall be used.

(iii) Breathing air couplings shall be incompatible with outlets for nonrespirable plant air or other gas systems to prevent inadvertent servicing of air-line breathing apparatus with nonrespirable gases.

(c) Respirable air supplied to a diver shall not contain:

(i) A level of carbon monoxide (CO) greater than 20 ppm;

(ii) A level of carbon dioxide (CO₂) greater than 1,000 ppm;

(iii) A level of oil mist greater than 5 milligrams per cubic meter; or

(iv) A noxious or pronounced odor.

(d) Compressor systems providing surface air to divers must have a low pressure warning device installed at the air purification system inlet to alert dive tenders of low air pressure.

The minimum alarm setting shall be 45 Psi plus an additional 15 Psi for each working atmosphere.

1 ATM = 33 fsw or 15 Psi

2 ATM = 66 fsw or 30 Psi

3 ATM = 99 fsw or 45 Psi

4 ATM = 132 fsw or 60 Psi

5 ATM = 165 fsw or 75 Psi

6 ATM = 198 fsw or 90 Psi

(e) The output of air compressor systems shall be tested for air purity every six months by means of samples taken at the connection to the distribution system, except that nonoil lubricated compressors need not be tested for oil mist.

(3) Breathing gas supply hoses.

(a) Breathing gas supply hoses shall:

(i) Have a working pressure at least equal to the working pressure of the total breathing gas system;

(ii) Have a rated bursting pressure at least equal to four times the working pressure;

(iii) Be tested at least annually to 1.5 times their working pressure; and

(iv) Have their open ends taped, capped or plugged when not in use.

(b) Breathing gas supply hose connectors shall:

(i) Be made of corrosion-resistant materials;

(ii) Have a working pressure at least equal to the working pressure of the hose to which they are attached; and

(iii) Be resistant to accidental disengagement.

(c) Umbilicals shall:

(i) Include a safety line which shall be attached in a manner to remove strain from the air supply hose;

(ii) Be marked in 10-foot increments to 100 feet beginning at the diver's end, and in 50 foot increments thereafter;

(iii) Be made of kink-resistant materials; and

(iv) Have a working pressure greater than the pressure equivalent to the maximum depth of the dive (relative to the supply source) plus 100 psi.

(4) Buoyancy control.

(a) Helmets or masks connected directly to the dry suit or other buoyancy-changing equipment shall be equipped with an exhaust valve.

(b) A dry suit or other buoyancy-changing equipment not directly connected to the helmet or mask shall be equipped with an exhaust valve.

(c) When used for SCUBA diving, a buoyancy compensator shall have an inflation source separate from the breathing gas supply.

(d) An inflatable flotation device capable of maintaining the diver at the surface in a face-up position, having a manually activated inflation source independent of the breathing supply, an oral inflation device, and an exhaust valve shall be used for SCUBA diving.

(5) Compressed gas cylinders. Compressed gas cylinders shall:

(a) Be designed, constructed and maintained in accordance with the applicable provisions of WAC 296-24-295 and 296-24-940 of the General safety and health standards.

(b) Be stored in a ventilated area and protected from excessive heat;

(c) Be secured from falling; and

(d) Have shut-off valves recessed into the cylinder or protected by a cap, except when in use or manifolded, or when used for SCUBA diving.

(6) Recompression/decompression chambers.

(a) Each recompression/decompression chamber manufactured after the effective date of this standard, shall be built and maintained in accordance with the ASME Code or equivalent.

(b) Each recompression/decompression chamber manufactured prior to the effective date of this standard shall be maintained in conformity with the code requirements to which it was built, or equivalent.

(c) Each recompression/decompression chamber shall be equipped with:

(i) Means to maintain the atmosphere below a level of 25% oxygen by volume;

(ii) Mufflers on intake and exhaust lines, which shall be regularly inspected and maintained;

(iii) Suction guards on exhaust line openings; and

(iv) A means for extinguishing fire, and shall be maintained to minimize sources of ignition and combustible material.

(7) Gauges and timekeeping devices.

(a) Gauges indicating diver depth which can be read at the dive location shall be used for all dives except SCUBA.

(b) Each depth gauge shall be deadweight tested or calibrated against a master reference gauge every six months, and when there is a discrepancy greater than two percent of full scale between any two equivalent gauges.

(c) A cylinder pressure gauge capable of being monitored by the diver during the dive shall be worn by each SCUBA diver.

(d) A timekeeping device shall be available at each dive location.

(8) Masks and helmets.

(a) Surface-supplied air and mixed-gas masks and helmets shall have:

(i) A nonreturn valve at the attachment point between helmet or mask and hose which shall close readily and positively; and

(ii) An exhaust valve.

(b) Surface-supplied air masks and helmets shall have a minimum ventilation rate capability of 4.5 acfm at any depth at which they are operated or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute.

(9) Oxygen safety.

(a) Equipment used with oxygen or mixtures containing over forty percent by volume oxygen shall be designed for oxygen service.

(b) Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent by volume oxygen shall be cleaned of flammable materials before use.

(c) Oxygen systems over 125 psig and compressed air systems over 500 psig shall have slow-opening shut-off valves.

(10) Weights and harnesses.

(a) Except when heavy gear is worn, divers shall be equipped with a weight belt or assembly capable of quick release.

(b) Except when heavy gear is worn or in SCUBA diving, each diver shall wear a safety harness with:

(i) A positive buckling device;

(ii) An attachment point for the umbilical to prevent strain on the mask or helmet; and

(iii) A lifting point to distribute the pull force of the line over the diver's body.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-570, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 87-02-002 (Order 86-44), § 296-37-570, filed 12/26/86. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-570, filed 10/2/78.]

WAC 296-37-575 Recordkeeping requirements. (1) Recording and reporting.

(a) The employer shall comply with the requirements of chapters 296-27 and 296-350 WAC.

(b) The employer shall record the occurrence of any diving-related injury or illness which requires any dive team member to be hospitalized for 24 hours or more, specifying the circumstances of the incident and the extent of any injuries or illnesses.

(2) Availability of records.

(a) Upon the request of the director of the department of labor and industries or his duly authorized designees, the employer shall make available for inspection and copying any record or document required by this standard.

[Title 296 WAC—p. 1074]

(b) Records and documents required by this standard shall be provided upon request to employees, designated representatives, and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217. Safe practices manuals (WAC 296-37-530), depth-time profiles (WAC 296-37-540), recording of dives (WAC 296-37-545), decompression procedure assessment evaluations (WAC 296-37-545), and records of hospitalizations (WAC 296-37-575) shall be provided in the same manner as employee exposure records or analyses using exposure or medical records. Equipment inspections and testing records which pertain to employees (WAC 296-37-570) shall also be provided upon request to employees and their designated representatives.

(c) Records and documents required by this standard shall be retained by the employer for the following period:

(i) Dive team member medical records (physician's reports) (WAC 296-37-525) - five years;

(ii) Safe practices manual (WAC 296-37-530) - current document only;

(iii) Depth-time profile (WAC 296-37-540) - until completion of the recording of dive, or until completion of decompression procedure assessment where there has been an incident of decompression sickness;

(iv) Recording dive (WAC 296-37-545) one year, except five years where there has been an incident of decompression sickness;

(v) Decompression procedure assessment evaluations (WAC 296-37-545) - five years;

(vi) Equipment inspections and testing records (WAC 296-37-570) - current entry or tag, or until equipment is withdrawn from service;

(vii) Records of hospitalizations (WAC 296-37-575) - five years.

(d) After the expiration of the retention period of any record required to be kept for five years, the employer shall forward such records to the National Institute for Occupational Safety and Health, Department of Health and Human Services. The employer shall also comply with any additional requirements set forth in WAC 296-62-05215.

(e) In the event the employer ceases to do business:

(i) The successor employer shall receive and retain all dive and employee medical records required by this standard; or

(ii) If there is no successor employer, dive and employee medical records shall be forwarded to the National Institute for Occupational Safety and Health, Department of Health and Human Services.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-37-575, filed 7/20/94, effective 9/20/94. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-575, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 87-02-002 (Order 86-44), § 296-37-575, filed 12/26/86. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-37-575, filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-575, filed 10/2/78.]

WAC 296-37-580 Reserved.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-580, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040, 49.17.050,

49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-580, filed 10/2/78.]

WAC 296-37-585 Appendix A to chapter 296-37 WAC—Examples of conditions which may restrict or limit exposure to hyperbaric conditions. (1) The following disorders may restrict or limit occupational exposure to hyperbaric conditions depending on severity, presence of residual effects, response to therapy, number of occurrences, diving mode, or degree and duration of isolation.

(a) History of seizure disorder other than early febrile convulsions.

(b) Malignancies (active) unless treated and without recurrence for five years.

(c) Chronic inability to equalize sinus and/or middle ear pressure.

(d) Cystic or cavitory disease of the lungs.

(e) Impaired organ function caused by alcohol or drug use.

(f) Conditions requiring continuous medication for control (e.g., antihistamines, steroids, barbiturates, mood altering drugs, or insulin).

(i) Meniere's disease.

(ii) Hemoglobinopathies.

(iii) Obstructive or restrictive lung disease.

(iv) Vestibular end organ destruction.

(v) Pneumothorax.

(vi) Cardiac abnormalities (e.g., pathological heart block, valvular disease, intraventricular conduction defects other than isolated right bundle branch block, angina pectoris, arrhythmia, coronary artery disease).

(vii) Juxta-articular osteonecrosis.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-585, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, and chapters 42.30 and 43.22 RCW. 78-10-094 (Order 78-18), § 296-37-585, filed 10/2/78.]

WAC 296-37-590 Appendix B to chapter 296-37 WAC—Guidelines for scientific diving. This appendix contains guidelines that will be used in conjunction with WAC 296-37-510 (2)(e) to determine those scientific diving programs which are exempt from the requirements for commercial diving. The guidelines are as follows:

(1) The diving control board consists of a majority of active scientific divers and has autonomous and absolute authority over scientific diving program's operations.

(2) The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are nonproprietary.

(3) The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.

(4) Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and, therefore, are scientists or scientists in training.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-37-590, filed 10/30/92, effective 12/8/92.]

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Chapter 296-43 WAC

HEATING INSTALLATIONS—CABLE, RADIANT, SOIL, ETC.

WAC

296-43-010	Heating cables—General.
296-43-020	Heating cables—Maximum wattage and temperature.
296-43-030	Heating cables—Permissible installation methods in buildings.
296-43-040	Heating cables—Thermal insulation.
296-43-050	Heating cables—Elements installed in tanks, troughs, or pipe lines containing liquids.
296-43-060	Heating element in soil or sand.
296-43-070	Heating element imbedded in driveways.

WAC 296-43-010 Heating cables—General. Heating cables or wires designed for use in low temperature heating applications, i.e., soil, water, plaster, walls and ceilings, floors, etc., shall conform to the provisions of the N.E.C. Article 422 as applicable and to the following specifications:

(1) The units shall be manufactured in such continuous lengths that the maximum temperature of the element does not exceed 100 degrees C. or the maximum safe working temperature of the insulating material covering the element. Whichever is the lower temperature shall be considered the maximum permissible working temperature of the element.

(2) The insulation on the element shall equal that specified for equivalent 600 v. combined Type TW and TH or RW and RH conductor insulation and, in addition, shall meet the following requirements:

(a) Permissible maximum water absorption shall not exceed .015 grams per sq. in. of surface in distilled water at 70 degree C. in 7 days.

(b) Maximum safe operating temperature of the insulation shall not be less than 70 degrees C.

(c) It shall be suitable for the purpose intended and approved by the Washington state electrical inspection department as such.

(d) Samples for testing: The manufacturer shall submit suitable samples to the Washington state inspection department for inspection and testing as required.

(e) Marking: Each unit shall be provided with permanent labels or markings at the factory.

(i) These labels shall be placed not more than 3 in. from the terminal on each end and shall include the makers' name and the normal rating in volts and amperes; or, volts and watts.

(ii) 120 volt labels shall be bright metal or white in color. 240 v. labels shall be colored red.

(f) Units shall be installed in their complete lengths as supplied by the factory. Units from which a label or labels are missing will be considered shortened and will not be approved until such time as the installing contractor shall provide proof, by connecting suitable test meters into the circuits with which the inspector, at his convenience, may satisfy himself that the element is suitable for the purpose intended.

(g) Heating element units shall not be covered until clearance has been received from the local inspecting authority.

(h) Lead covered heating elements shall not be permitted in direct contact with plaster, concrete or similar materials capable of causing crystallization and/or checking of the lead

sheath, unless protected by a suitable covering of chemically inert material.

(i) All control equipment must be of approved type and of suitable rating for the use intended.

[Rules (part), filed 4/3/61.]

WAC 296-43-020 Heating cables—Maximum wattage and temperature. (1) In contact with combustible material. Maximum wattage of the element shall not exceed 3 watts per lineal foot or maximum temperature of 60 degrees C. (140 degrees F.) when in direct contact with combustible material or applied over existing ceilings.

(2) Imbedded in cement. Maximum wattage of the element shall not exceed 4 watts per lineal foot or maximum temperature of 80 degrees C. (194 degrees F.) when imbedded in cement, plaster or similar noncombustible, heat-diffusing material.

[Rules (part), filed 4/3/61.]

WAC 296-43-030 Heating cables—Permissible installation methods in buildings. Wiring to the elements shall conform to the National Electrical Code and to the following conditions:

(1) Terminals.

(a) Termination of radiant heating elements shall be with solderless lugs, binding posts, or similar compression terminals.

(b) Terminal boxes for radiant heating elements, where they are terminated in junction boxes and also for the circuit wires with which they are connected, shall be protected by asbestos, glass, or similar noncombustible sleeving to a point at least 18 in. from the terminal.

(c) Not more than 3 in. of element per lead shall be permitted inside the terminal box and not more than two heating element leads shall be terminated in any 1-gang terminal box.

(d) The use of metal raceways for terminating radiant heating cables is permissible providing 6 in. clearance is maintained between points where elements enter the raceways, and, that the elements are terminated as provided in subsections (1)(b) and (1)(c) above.

(e) Where nonheating leads, at least 2 ft. in length, from the element are provided by the factory requirements of subsections (1)(b), (1)(c) and (1)(d) above may be waived, providing that the number of wires per box shall comply with section 3705 of the N.E.C.

(2) Imbedded in plaster. Heating elements, when imbedded in plaster, shall conform to the following provisions:

(a) Adjacent turns shall be not less than 1 in. apart and secured suitably by insulated staples, adhesive tape, patching plaster, plaster of paris, or other suitable means of attachment, as approved by the local inspecting authority, on not less than 2 ft. centers.

(b) Nonmetallic insulating tape shall be used where the element crosses metal reinforcing on rock plaster board and similar lath substitutes, when the heating element is applied directly to the lath base. (Where possible, nonmetallic reinforcing should be substituted to avoid the hum that is occasionally generated in the reinforcing while the current is on.)

(c) When heating element is used on a surface employing metal lath base, a brown coat shall be applied sufficient to completely cover the metal lath before the element is applied; and, adhesive tape, patching plaster, plaster of paris, or other suitable means of attachment be used to secure the element in place.

(d) Heating element shall only be applied to fire resistant plaster bases.

(3) Imbedded in concrete floors. Heating elements imbedded in concrete floors shall conform to the following provisions:

(a) Adjacent turns shall not be less than 1 in. apart and shall be held securely in place by suitable frames or spreaders while the concrete topping is applied.

(b) Heating cables shall maintain at least 1 in. clearance between the element and adjacent metallic pipe or similar conductors imbedded in the slab.

(c) Suitable rigid conduit risers shall be provided for terminating elements imbedded in concrete floors unless raceways or other adequate means are provided for protecting the elements where they leave the slab.

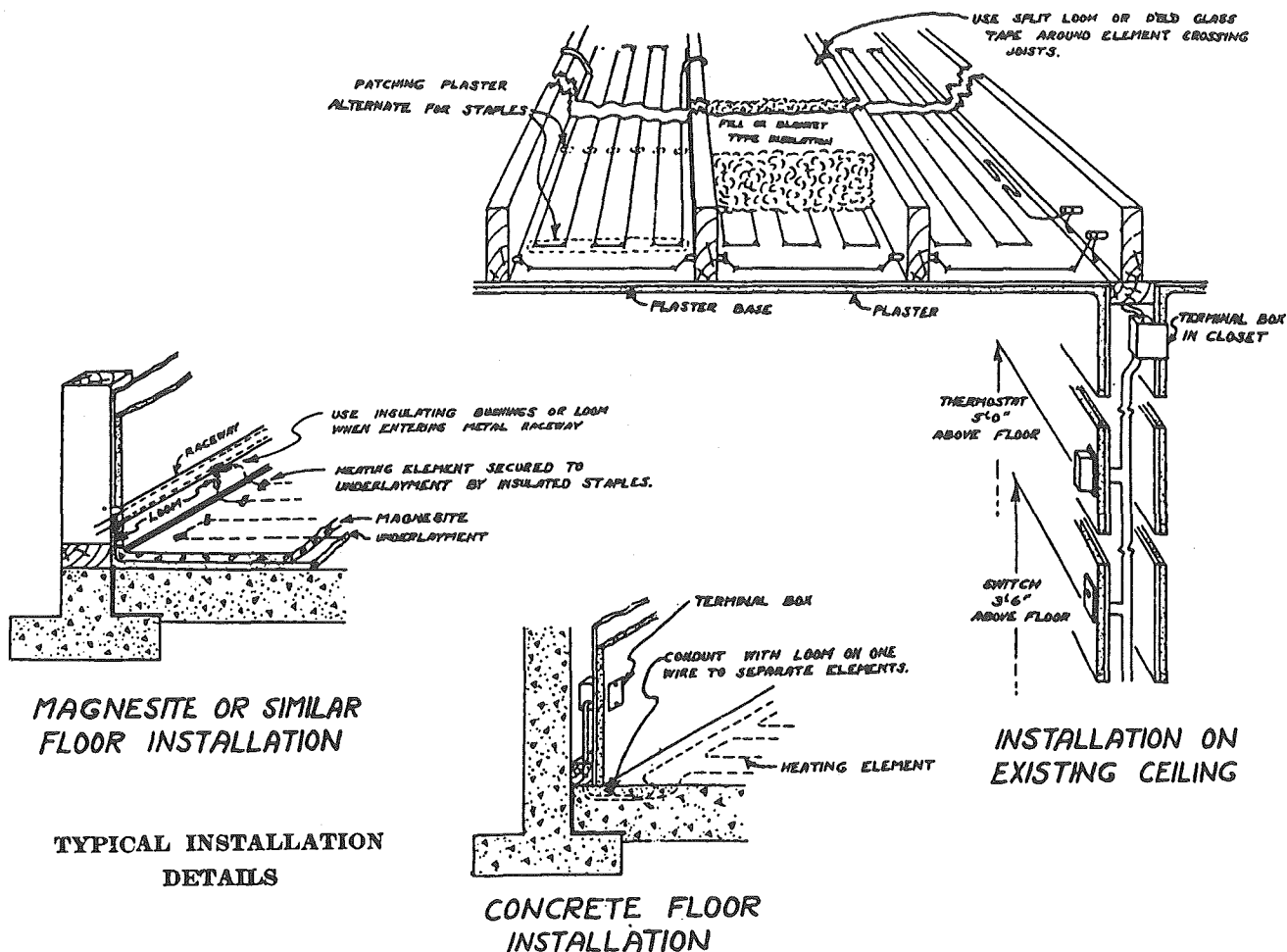
(d) Insulating sleeves shall be placed over the element from the point where it enters the slab through the conduit to the terminating box, unless nonheating leads, not less than 2 ft. long, are provided with the element by the factory.

(e) Suitable insulating bushings shall be used to separate the leads or elements where they enter the conduit in the slab.

(4) Magnesite, terrazzo, tile and similar floors and walls.

(a) Shall conform to the provisions of sections 1, 2, and 3 as applicable.

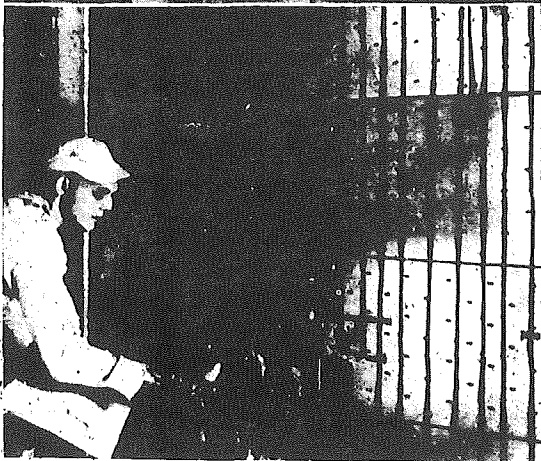
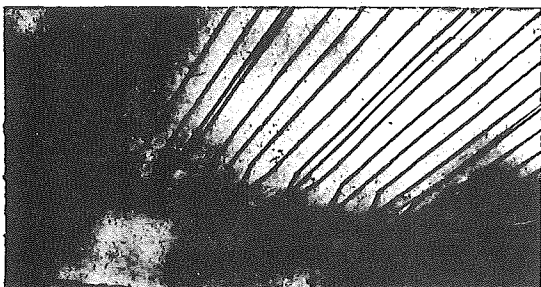
(b) Heating cables may be attached to the surface of the underlayment where magnesite or terrazzo floors are installed.



MAGNESITE OR SIMILAR FLOOR INSTALLATION

TYPICAL INSTALLATION DETAILS

CONCRETE FLOOR INSTALLATION



Upper: Heating cable applied to plaster board ceiling ready for plaster. Note clearance between metal lath and heating cable.

Lower: Heating cable applied to plaster board wall. Note that elements run vertically to allow plasterer to apply the brown coat parallel to the cable.

(5) Linoleum, asphalt tile and similar floor coverings may be placed over heating elements on wood floors providing the element is first covered with 3/8 in. of magnesium oxychloride or equal fire resistant underlayment.

(6) Existing ceilings.

(a) Heating elements placed over existing ceilings shall be suitably secured thereto conforming to the provisions of WAC 296-43-020(1), and 296-43-030 (1), (2), and (3) as applicable.

(b) Wood lath shall be covered with asbestos paper, gypsum board or similar fire resistant material before the element is applied to the ceiling.

(c) Heating elements shall not be applied over insulating board type of lath such as celotex, insulite, firtex, and similar materials. Where this type of material is used, the element should be secured to the under face of the ceiling and covered with plaster or fire resistant board of a noninsulating type.

(d) Elements crossing ceiling joints shall be enclosed in split loom or folded glass tape to protect the element applied directly thereto.

(7) Gypsum board, plaster lath and similar heat conducting fire resistant materials may have the heating element

(8) Ceilings of combustible material; i.e., wood veneer, tempered hardboard and similar heat conducting materials shall first be covered by asbestos paper, gypsum board, or similar fire resistant material.

(9) Pads containing heating elements for placing heating elements in spaces over existing ceilings or in walls or floors which are otherwise inaccessible, shall conform to the provisions of WAC 296-43-010 (1), (2), 296-43-020(1), 296-43-030 (6), (7), (8), and 296-43-040 as applicable, and the following specifications:

(a) The pads shall be of fire resistant, nonconducting material.

(b) The pads shall rigidly secure the element in such a manner that it will be impossible for the adjacent turns of the element to touch.

(i) The leads shall be suitably secured to the pad in a manner which provides permanent adequate separation between the leads.

(ii) The leads shall be covered with an insulating sleeve from the pad to the termination of the heating part of the element.

(iii) All connections must be accessible.

[Rules (part), filed 4/3/61.]

WAC 296-43-040 Heating cables—Thermal insulation. Thermal insulation placed over heating elements or in contact therewith shall be noncorrosive, noncombustible, nonconducting material as provided in section 3249 of the N.E.C.

[Rules (part), filed 4/3/61.]

WAC 296-43-050 Heating cables—Elements installed in tanks, troughs, or pipe lines containing liquids. Elements installed in tanks, troughs or pipe lines containing liquids shall be provided with suitable insulating terminating bushings and terminal boxes at the points where the element enters and leaves the tank, trough, or pipe line. Elements so installed shall be secured in a manner maintaining at least 1 in. clearance between turns.

[Rules (part), filed 4/3/61.]

WAC 296-43-060 Heating element in soil or sand. (1) Heating element in soil or sand shall be so spaced that the minimum distance between adjacent turns is not less than 1 in.

(2) Heating elements shall never be placed directly in peat moss or similar material of an insulating nature. Where peat moss or similar material is used, the element shall be protected by a layer of at least 1 in. over and 1 in. under the element, of a heat conducting material such as sand.

(3) Suitable drains for condensation shall be provided at the bottom of all boxes used in greenhouse or hotbed wiring.

(4) Where open wiring is used in greenhouses and hotbeds, the use of nonmetallic boxes and covers is recommended as provided in section 3716 of the N.E.C.

[Rules (part), filed 4/3/61.]

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WAC 296-43-070 Heating element imbedded in driveways. Heating elements imbedded in driveways shall conform to the provisions of WAC 296-43-010, 296-43-020 and 296-43-030(3), as applicable.

[Rules (part), filed 4/3/61.]

**Chapter 296-45 WAC
SAFETY STANDARDS FOR ELECTRICAL WORKERS**

WAC

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296-45-48540	Chlorine systems.

296-45-48545	Boilers.	296-45-120	Tools—Inspection of tools. [§ IV, Rules 4.8 and 4.9, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-48550	Turbine generators.	296-45-130	Tools—Storage of tools and materials. [§ IV, Rule 4.10, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-48555	Coal and ash handling.	296-45-140	Tools—Hand tools—Using metal objects. [§ IV, Rules 4.11 and 4.12, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-48560	Hydroplants and equipment.	296-45-150	Tools—Ladders. [§ IV, Rules 4.13 through 4.27, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-525	Special conditions.	296-45-160	Tools—Scaffolds. [§ IV, Rule 4.28, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52505	Capacitors.	296-45-170	Tools—Guards and barriers. [§ IV, Rule 4.29, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52510	Current transformer secondaries.	296-45-180	Tools—Grounding equipment. [§ IV, Rules 4.30 and 4.31, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52515	Series streetlighting.	296-45-190	Tools—Hot line tools. [§ IV, Rules 4.32 and 4.33, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52520	Illumination	296-45-200	Tools—Switch stick. [§ IV, Rules 4.34 and 4.35, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52525	Protection against drowning.	296-45-210	Tools—Climbing equipment. [§ IV, Rules 4.36 through 4.39, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52530	Employee protection in public work areas.	296-45-220	Protective devices—Rubber protective equipment. [§ IV, Rules 4.40 through 4.51, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52535	Backfeed.	296-45-230	Equipment—Soldering equipment. [§ IV, Rules 4.52 through 4.55, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52540	Lasers.	296-45-240	Equipment—Fire extinguishers. [§ IV, Rule 4.56, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52545	Hydraulic fluids.	296-45-250	Wearing apparel. [§ 296-45-250, filed 1/3/68; § IV, Rules 4.57 through 4.61, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-52550	Foreign attachments and placards.	296-45-260	Transportation—Motor vehicle and trailer operations law. [§ IV, Rule 4.62, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-545	Trolley maintenance, jumpering or bypassing.	296-45-270	Transportation—Safety practices. [§ 296-45-270, filed 1/3/68; § IV, Rules 4.63 through 4.69, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-675	Rotorcraft/helicopter for power distribution and transmission line installation, construction and repair—Scope.	296-45-280	Employee qualifications. [§ V, Rule 5.1, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67503	Definitions.	296-45-290	Work required of foreman. [§ V, Rule 5.2, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67505	Briefing.	296-45-300	Number of men required to do work safely. [§ V, Rules 5.3 through 5.5, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67507	Signals.	296-45-310	Replacing or pulling fuses. [§ V, Rules 5.6 through 5.8, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67509	Slings and tag lines.	296-45-320	Electric utility employee operated motor cranes, "A" frames, aerial lift equipment, hole digger, winches, etc. [§ V, Rule 5.9, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67511	Cargo hooks.	296-45-330	Working on or near energized lines or equipment. [§ V, Rules 5.10 through 5.15, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67513	Personal protective equipment.	296-45-340	Stringing or removing wires. [§ V, Rule 5.16, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67515	Wearing apparel.	296-45-350	Temporary guard poles and structures. [§ V, Rule 5.17, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67517	Loose gear and objects.	296-45-360	Safe working practices. [§ V, Rules 5.18 through 5.46, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67519	Housekeeping.	296-45-370	Overhead lines—Working above energized circuits over 5 KV. [§ V, Rules 5.47 through 5.50, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67521	Operator's responsibility.	296-45-380	Overhead lines—Using hot line tools. [§ V, Rules 5.51 through 5.54, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-67523	Hooking and unhooking loads.		
296-45-67525	Static charge.		
296-45-67527	Load permitted.		
296-45-67529	Visibility.		
296-45-67531	Signal systems.		
296-45-67533	Approaching the helicopter.		
296-45-67535	In helicopter.		
296-45-67537	Sling and rigging.		
296-45-67539	Personnel.		
296-45-67541	Fires.		
296-45-67543	General.		
296-45-67545	Refueling operations.		
296-45-900	Appendices.		
296-45-901	Appendix A—Nonmandatory.		
296-45-903	Appendix B—Protection from step and touch potentials—Nonmandatory.		
296-45-905	Appendix C—Methods of inspecting and testing wood poles—Nonmandatory.		

Reviser's note: Chapter 296-44 WAC Safety Standards—Electrical Construction code was absorbed into this chapter with the filing of WSR 98-07-009, filed 3/6/98, effective 5/6/98.

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-45-010	General. [§ 296-45-010, filed 1/3/68; § I, Rules 1.1 through 1.9, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-020	Causes of accident. [§ I, Rule 1.10, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-030	Safety. [§ I, Rule 1.11, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-040	Definitions. [§ I, Rules 1.12 through 1.29, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-050	Employer's responsibility. [§ II, Rules 2.1 through 2.11, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-060	Foreman's responsibility. [§ II, Rules 2.12 through 2.23, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-070	Employees' responsibility. [§ II, Rules 2.24 through 2.31, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-080	First aid. [§ III, Rules 3.1 through 3.4, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-090	Industrial hygiene. [§ III, Rules 3.5 through 3.7, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
296-45-110	Tools—General. [§ IV, Rules 4.1 through 4.7, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.

- 296-45-390 Overhead lines—Strength of spans and their supports. [§ V, Rules 5.55 and 5.56, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-400 Overhead lines—Foreign operations. [§ V, Rule 5.57, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-410 Overhead lines—Tree trimming. [§ V, Rule 5.58, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-420 Overhead lines—Foreign attachments and placards. [§ V, Rule 5.59, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-430 Substations and generating plants—General. [§ V, Rules 5.60 through 5.64, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-440 Maintenance of clearance. [§ V, Rule 5.65, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-450 Number of men required to work safely. [§ V, Rule 5.66, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-460 Safe working practices. [§ V, Rules 5.67 through 5.78, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-470 Clearances. [§ VI, Rules 6.1 through 6.13, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-480 Grounding. [§ VI, Rules 6.14 through 6.25, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-490 Underground maintenance—General. [§ VII, Rule 7.1, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-500 Underground maintenance—Working in manholes. [§ VII, Rules 7.2 through 7.7, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-510 Underground maintenance—Guarding manholes and street openings. [§ VII, Rules 7.8 through 7.12, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-520 Underground maintenance—Use of tools and equipment. [§ VII, Rules 7.13 through 7.17, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-530 Underground maintenance—Pulling U.G. cable. [§ VII, Rule 7.18, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-540 Underground maintenance—Testing. [§ VII, Rules 7.19 through 7.21, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-550 Underground maintenance—Fishing conduit or ducts. [§ VII, Rule 7.22, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-560 Underground maintenance—Working in elevated position. [§ VII, Rule 7.23, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-570 Underground maintenance—Grounding U.G. power conductors and equipment. [§ VII, Rules 7.24 through 7.27, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-580 Trolley maintenance. [§ VII, Rules 7.28 through 7.40, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-590 Aerial manlift equipment. [§ 296-45-590, filed 1/3/68; § VIII, Rules 8.1 through 8.10, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-600 Conclusion. [Matter following Rule 8.10, filed 3/23/60, effective 2/3/56.] Repealed by Order 76-38, filed 12/30/76.
- 296-45-60013 Hand and portable powered tools. [Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-45-60013, filed 10/28/96, effective 1/1/97.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-650 Electrical workers safety rules—Foreword. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-650, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-650, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65003 Scope and application. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65003, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65003, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65005 Definitions. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65005, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65005, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65009 Employer's responsibility. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65009, filed 9/30/94, effective 11/20/94; 89-11-035 (Order 89-03), § 296-45-65009, filed 5/15/89, effective 6/30/89; Order 76-38, § 296-45-65009, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65011 Leadworker's responsibility. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65011, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65011, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65013 Leadworker-employee responsibility. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65013, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65013, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65015 Work required of leadworkers. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65015, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65015, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65017 Employee's responsibility. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65017, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65017, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65019 First aid. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65019, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65019, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65021 Tools and protective equipment. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65021, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65021, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65023 Clearances, operating power lines and equipment. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65023, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65023, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65025 Grounding. [Order 76-38, § 296-45-65025, filed 12/30/76.] Repealed by 88-11-021 (Order 88-04), filed 5/11/88. Statutory Authority: Chapter 49.17 RCW.
- 296-45-65026 Personal protective grounding. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65026, filed 9/30/94, effective 11/20/94; 91-24-017 (Order 91-07), § 296-45-65026, filed 11/22/91, effective 12/24/91; 88-11-021 (Order 88-04), § 296-45-65026, filed 5/11/88.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65027 General requirements. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65027, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65027, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.

- 296-45-65029 Overhead lines. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65029, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65029, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65031 Poles and pole settings. [Order 76-38, § 296-45-65031, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65033 Transmission line construction. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65033, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65033, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65035 Substations. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65035, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65035, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65037 Underground. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65037, filed 9/30/94, effective 11/20/94; 88-11-021 (Order 88-04), § 296-45-65037, filed 5/11/88; Order 76-38, § 296-45-65037, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65038 Underground residential distribution (URD). [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65038, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-45-65038, filed 11/30/83; 83-15-017 (Order 83-19), § 296-45-65038, filed 7/13/83, effective 9/12/83.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65039 Trolley maintenance, jumpering or bypassing. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65039, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65039, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65041 Aerial manlift equipment. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65041, filed 9/30/94, effective 11/20/94; 89-11-035 (Order 89-03), § 296-45-65041, filed 5/15/89, effective 6/30/89; Order 76-38, § 296-45-65041, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65043 All motor vehicle and trailer operations. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-45-65043, filed 3/30/82; Order 76-38, § 296-45-65043, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65045 Material handling. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-65045, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65045, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-65047 Specification for lineworker's belts and similar equipment. [Statutory Authority: Chapter 49.17 RCW. 95-10-016, § 296-45-65047, filed 4/25/95, effective 10/1/95; 94-20-057 (Order 94-16), § 296-45-65047, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-65047, filed 12/30/76.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-6600 Tree trimming. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-6600, filed 6/17/81.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-66001 Electrical hazards. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-66001, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-66001, filed 6/17/81.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-66003 Tools and protective equipment. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-66003, filed 6/17/81.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-66005 Insulated tools used for tree trimming. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-66005, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-66005, filed 6/17/81.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-66007 Aerial manlift equipment. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-66007, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-13-045 (Order 82-22), § 296-45-66007, filed 6/11/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-66007, filed 6/17/81.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-66009 All motor vehicle and trailer operations. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-66009, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-66009, filed 6/17/81.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-66011 Working in proximity to electrical hazards. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-66011, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-45-66011, filed 6/17/81.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-680 Communication facilities. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-680, filed 9/30/94, effective 11/20/94.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-690 Power generation. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-690, filed 9/30/94, effective 11/20/94.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-695 Hazardous energy control (lockout/tagout) procedures. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-695, filed 9/30/94, effective 11/20/94.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.
- 296-45-700 Testing and test facilities. [Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-700, filed 9/30/94, effective 11/20/94.] Repealed by 98-07-009, filed 3/6/98, effective 5/6/98. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060.

WAC 296-45-005 Electrical workers safety rules—

Foreword. The purpose of this chapter is to make the workplace of electrical employees as free from recognized hazards as reasonably possible. Following these rules may sometimes require that employee safety receive a higher priority than speed and work performance. These rules exist to provide employee safety, so employees are expected, in good faith, to follow the provisions of this chapter. This chapter is not intended to be a complete job description nor is it expected

that the chapter covers every hazard that an employee may encounter. When a hazard exists that is not covered by this chapter, the leadworker and employees are expected, in good faith, to mutually discuss the hazard and agree how to perform the work with the greatest degree of safety.

The department of labor and industries is the sole and paramount administrative agency responsible for the administration and interpretation of this chapter and the Washington Industrial Safety and Health Act of 1973. If there exists a question as to the meaning of any provision of this chapter, such question must first be directed to the department of labor and industries and its authorized representatives.

Experience has proven that the majority of injuries and deaths are preventable. Most injuries and deaths are not due to defective equipment but are due to failure on the part of the employees and those in authority to observe safety rules and failure to use safety devices. In the last analysis, this chapter is a compilation of experience and common sense. Electrical safety requires that the work be properly planned, executed by the use of good judgment and under the direction of intelligent supervision.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-005, filed 3/6/98, effective 5/6/98.]

WAC 296-45-015 Scope and application. (1) This chapter covers the operation and maintenance of electric power generation, control, transformation, transmission, and distribution lines and equipment. These provisions apply to:

(a) Power generation, transmission, and distribution installations, including related equipment for the purpose of communication or metering, which are accessible only to qualified employees;

Note: The types of installations covered by this chapter include the generation, transmission, and distribution installations of electric utilities, as well as equivalent installations of industrial establishments. Trolley maintenance, jumpering, and bypass is also covered by this chapter. Supplementary electric generating equipment that is used to supply a workplace for emergency, standby, or similar purposes only is covered under Part L of chapter 296-24 WAC.

(b) Other installations at an electric power generating station, as follows:

(i) Fuel and ash handling and processing installations, such as coal conveyors;

(ii) Water and steam installations, such as penstocks, pipelines, and tanks, providing a source of energy for electric generators; and

(iii) Chlorine and hydrogen systems.

(c) Test sites where electrical testing involving temporary measurements associated with electric power generation, transmission, and distribution is performed in laboratories, in the field, in substations, and on lines, as opposed to metering, relaying, and routine line work;

(d) Work on or directly associated with the installations covered in subsections (1)(a) through (c) of this section; and

(e) Line-clearance tree-trimming operations, as follows:

(i) This chapter except WAC 296-45-455, applies to line-clearance tree-trimming operations performed by qualified employees (those who are knowledgeable in the construction and operation of electric power generation, trans-

mission, or distribution equipment involved, along with the associated hazards).

(ii) WAC 296-45-065, 296-45-125, 296-45-135, 296-45-255, 296-45-315, 296-45-375, and 296-45-455 through 296-45-45530 apply to line-clearance tree-trimming operations performed by line-clearance tree trimmers who are not qualified employees.

(2) Notwithstanding subsection (1) of this section, this chapter does not apply to electrical installations, electrical safety-related work practices, or electrical maintenance considerations covered by Part L of chapter 296-24 WAC.

Note 1: Work practices conforming to WAC 296-24-970 through 296-24-985 are considered as complying with the electrical safety-related work practice requirements of this chapter, provided the work is being performed on a generation or distribution installation meeting WAC 296-24-95601 through 296-24-95699. This chapter also applies to work by qualified persons directly on or associated with installations of electric power generation, transmission, and distribution lines or equipment, regardless of compliance with WAC 296-24-970 through 296-24-985.

Note 2: Work practices performed by qualified persons and conforming to this chapter are considered as complying with WAC 296-24-95601 through 296-24-95699.

(3) This section applies in addition to all other applicable safety and health standards administered by the department. Specific references in this section to other standards are provided for emphasis only.

(4) Operation, conditions, work methods and other work related situations or activities not specifically covered by this chapter are subject to the rules and regulations of chapter 296-24 WAC, General safety and health standards; chapter 296-62 WAC, General occupational health standards; chapter 296-155 WAC, Safety standards for construction work; and, insofar as applicable to employee safety and health, chapter 19.29 RCW. Additionally, operations, conditions, work methods and other work related situations or activities may be subject to additional rules and regulations depending upon the nature of the work being performed.

(5) These rules shall not apply to the use of existing electrical installations during their lifetime, provided they are maintained in good condition and in accordance with the applicable safety factor requirements and the rules in effect at the time they were installed, and provided that reconstruction shall conform to the rules as herein provided.

(6) Any rule, regulation or standard contained within this chapter, if subject to interpretation, shall be interpreted so as to achieve employee safety, which is the ultimate purpose of this chapter.

(7) Should a rule or standard contained within this chapter conflict, in any manner, with a standard or rule contained within any other chapter of Title 296 WAC the standard or rule contained herein shall apply so long as the work being done is power generation, transmission, and distribution installations, including related equipment for the purpose of communication or metering, which are accessible only to qualified employees. If there are rules within this chapter that conflict, the rule that provides the greatest employee safety will apply.

(8) Neither the promulgation of these rules, nor anything contained in these rules shall be construed as affecting the relative status or civil rights or liabilities between employers and their employees and/or the employees of others and/or

the public generally; nor shall the use herein of the words "duty" and "responsibility" or either, import or imply liability other than provided for in the industrial insurance and safety laws of the state of Washington, to any person for injuries due to negligence predicated upon failure to perform or discharge any such "duty" or "responsibility," but failure on the part of the employees, leadworker, or employer to comply with any compulsory rule may be cause for the department of labor and industries to take action in accordance with the industrial insurance and safety laws.

(9) "Shall" and "must" as used in this chapter make the provisions mandatory. "Should," "may," or "it is recommended" are used to indicate the provisions are not mandatory but are recommended.

(10) If any section, subsection, phrase, or provisions of this chapter or part thereof should be held invalid by any court for any reason, such invalidity shall not in any way affect the validity of the remainder of this chapter, unless such decision renders the remainder of the provision unintelligible, or changes the meaning of such other provision or provisions.

(11) When the language used in this chapter indicates that it is the responsibility, duty, or obligation of the leadworker or other employee, it shall also be the employer's responsibility, obligation, and duty.

Whenever this chapter refers to the provisions of another safety and health standard or statute affecting safety and health, such reference refers to the statute or code in effect at the time the work is being performed.

[Statutory Authority: RCW 49.17.040, 99-09-080, § 296-45-015, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-015, filed 3/6/98, effective 5/6/98.]

WAC 296-45-025 Variances. Under certain circumstances, an employer may obtain a variance from the director of the department of labor and industries or an authorized representative. Until such time as a variance is granted, the employer and employees must comply with the mandatory provisions of this chapter. The procedure and requirements for variances are found in chapter 296-350 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-025, filed 3/6/98, effective 5/6/98.]

WAC 296-45-035 Definitions. These definitions apply to chapter 296-45 WAC.

"Aerial manlift equipment" - Equipment such as extended towers, boom-mounted cages or baskets, and truck-mounted ladders, that is primarily designed to place personnel and equipment aloft to work on elevated structures and equipment.

"Affected employee" - An employee whose job requires him or her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him or her to work in an area in which such servicing or maintenance is being performed.

"Apprentice" - An employee who is being trained to be journey level.

"Approved" - Meets or exceeds the recognized standards of safety within the industry.

"Approved protectors" - Gloves worn over rubber insulating gloves which are of such material or substance and so constructed as to protect the rubber gloves from abrasions, lacerations, or other physical damage which might otherwise occur to rubber gloves. Approved protectors must conform to the standards which are recognized by the industry.

"Attendant" - An employee assigned to remain immediately outside the entrance to an enclosed or other space to render assistance as needed to employees inside the space.

"Authorized employee" - An employee who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this section.

"Automatic circuit recloser" - A self-controlled device for interrupting and reclosing an alternating current circuit with a predetermined sequence of opening and reclosing followed by resetting, hold-closed, or lockout operation.

"Barricade" - A physical obstruction such as tapes, cones, or A-frame type wood or metal structures intended to provide a warning about and to limit access to a hazardous area.

"Barrier" - A physical obstruction which is intended to prevent contact with energized lines or equipment or to prevent unauthorized access to a work area.

"Bond" - The electrical interconnection of conductive parts designed to maintain a common electrical potential.

"Bus" - A conductor or a group of conductors that serve as a common connection for two or more circuits.

"Bushing" - An insulating structure, including a through conductor or providing a passageway for such a conductor, with provision for mounting on a barrier, conducting or otherwise, for the purposes of insulating the conductor from the barrier and conducting current from one side of the barrier to the other.

"Cable" - A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

"Cable sheath" - A conductive protective covering applied to cables.

Note: A cable sheath may consist of multiple layers of which one or more is conductive.

"Circuit" - A conductor or system of conductors through which an electric current is intended to flow.

"Clearance" (between objects) - The clear distance between two objects measured surface to surface.

"Clearance" (for work) - Authorization to perform specified work or permission to enter a restricted area.

"Communication lines." (See "Lines, communication.")

"Conductor" - A material, usually in the form of a wire, cable, or bus bar, used for carrying an electric current.

"Covered conductor" - A conductor covered with a dielectric having no rated insulating strength or having a

rated insulating strength less than the voltage of the circuit in which the conductor is used.

"Current-carrying part" - A conducting part intended to be connected in an electric circuit to a source of voltage. Noncurrent-carrying parts are those not intended to be so connected.

"De-energized" - Free from any electrical connection to a source of potential difference and from electric charge; not having a potential difference from that of the earth.

Note: The term is used only with reference to current-carrying parts, which are sometimes energized (alive).

"Designated employee/person" - An employee/person who is designated by the employer to perform specific duties under the terms of this section and who is knowledgeable in the construction and operation of the equipment and the hazards involved.

"Electric line truck" - Any vehicle used to transport employees, tools, and material, which serves as a traveling workshop for electric power line construction and maintenance work. It may be equipped with a boom and auxiliary equipment for setting poles, digging holes, and elevating material and/or workers.

"Electric supply equipment" - Equipment that produces, modifies, regulates, controls, or safeguards a supply of electric energy.

"Electric supply lines." (See "Lines, electric supply.")

"Electric utility" - An organization responsible for the installation, operation, or maintenance of an electric supply system.

"Emergency" - An unforeseen occurrence endangering life, limb, or property.

"Enclosed" - Surrounded by a case, cage, fence or otherwise which will protect the contained equipment and prevent accidental contact of a person with live parts.

"Enclosed space" - A working space, such as a man-hole, vault, tunnel, or shaft, that has a limited means of egress or entry, that is designed for periodic employee entry under normal operating conditions, and that under normal conditions does not contain a hazardous atmosphere, but that may contain a hazardous atmosphere under abnormal conditions.

Note: Spaces that are enclosed but not designed for employee entry under normal operating conditions are not considered to be enclosed spaces for the purposes of this section. Similarly, spaces that are enclosed and that are expected to contain a hazardous atmosphere are not considered to be enclosed spaces for the purposes of this section. Such spaces meet the definition of permit spaces in WAC 296-62-145, and entry into them must be performed in accordance with that standard.

"Energized" (alive, live) - Electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of earth in the vicinity.

"Energy isolating device" - A physical device that prevents the transmission or release of energy, including, but not limited to, the following: A manually operated electric circuit breaker, a disconnect switch, a manually operated switch, a slide gate, a slip blind, a line valve, blocks, and any similar device with a visible indication of the position of the

device. (Push buttons, selector switches, and other control-circuit-type devices are not energy isolating devices.)

"Energy source" - Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, or other energy source that could cause injury to personnel.

"Equipment" (electric) - A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like used as part of or in connection with an electrical installation.

"Exposed" - Not isolated or guarded.

"Fault current" - The current that flows in an electrical system because of a defect in the circuit induced accidentally or otherwise.

"Fixed ladder" - A ladder that is permanently secured to a structure.

"Ground" - A conducting connection, whether intentional or accidental, between an electric circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

"Grounded" - Connected to earth or to some conducting body that serves in place of the earth.

"Grounded system" - A system of conductors in which at least one conductor or point (usually the middle wire, or neutral point of transformer or generator windings) is intentionally grounded either solidly or through a current-limiting device (not a current-interrupting device).

"Groundperson" - A member of crew working on ground under direction of a leadworker.

"Guarded" - Covered, fenced, enclosed, or otherwise protected, by means of suitable covers or casings, barrier rails or screens, mats, or platforms, designed to prevent the possibility, under normal conditions, of dangerous approach or accidental contact by persons or objects.

Note: Wires which are insulated, but not otherwise protected, are not considered as guarded.

"Hazardous atmosphere" - An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from an enclosed space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
- Airborne combustible dust at a concentration that meets or exceeds its LFL;

Note: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less;

- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in chapter 296-62 WAC, Part L, or in chapter 296-62 WAC, toxic and hazardous substances, and which could result in employee exposure in excess of its dose or permissible exposure limit;

Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

• Any other atmospheric condition that is "immediately dangerous to life or health" (IDLH).

"IDLH" - Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

Note: Some materials (hydrogen fluoride gas and cadmium vapor, for example) may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

Note: For air contaminants for which WISHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, chapter 296-62 WAC, Part C, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

"High-power tests" - Tests in which fault currents, load currents, magnetizing currents, and line-dropping currents are used to test equipment, either at the equipment's rated voltage or at lower voltages.

"High-voltage tests" - Tests in which voltages of approximately 1000 volts are used as a practical minimum and in which the voltage source has sufficient energy to cause injury.

"High wind" - A wind of such velocity that the following hazards would be present:

- An employee would be exposed to being blown from elevated locations; or
- An employee or material handling equipment could lose control of material being handled; or
- An employee would be exposed to other hazards not controlled by the standard involved.

Note: Winds exceeding 40 miles per hour (64.4 kilometers per hour), or 30 miles per hour (48.3 kilometers per hour) if material handling is involved, are normally considered as meeting this criteria unless precautions are taken to protect employees from the hazardous effects of the wind.

"Insulated" - Separated from other conducting surfaces by a dielectric (including air space) offering a high resistance to the passage of current.

Note: When any object is said to be insulated, it is understood to be insulated for the conditions to which it is normally subjected. Otherwise, it is, within the purpose of this section, uninsulated.

"Insulation" (cable) - That which is relied upon to insulate the conductor from other conductors or conducting parts or from ground.

"Insulation shielding" - An envelope which encloses the insulation of a cable and provides an equipotential surface in contact with cable insulation.

"Isolated" - An object that is not readily accessible to persons unless special means of access are used.

"Leadworker" - The person directly in charge of workers doing the work, regardless of title.

"Line-clearance tree trimmer" - An employee who, through related training or on-the-job experience or both, is

familiar with the special techniques and hazards involved in line-clearance tree trimming.

Note 1: An employee who is regularly assigned to a line-clearance tree-trimming crew and who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a line-clearance tree trimmer is considered to be a line-clearance tree trimmer.

Note 2: A line-clearance tree trimmer is not considered to be a "qualified employee" under this section unless he or she has the training required for a qualified employee under WAC 296-45-065. However, under the electrical safety-related work practices standard, a line-clearance tree trimmer is considered to be a "qualified employee." Tree trimming performed by such "qualified employees" is not subject to the electrical safety-related work practice requirements contained in WAC 296-24-970. (See also the note following WAC 296-24-970 for information regarding the training an employee must have to be considered a qualified employee.)

"Line-clearance tree trimming" - The pruning, trimming, repairing, maintaining, removing, or clearing of trees or the cutting of brush that is within 10 feet (305 cm) of electric supply lines and equipment.

"Lines" -

• **"Communication lines"** - The conductors and their supporting or containing structures which are used for public or private signal or communication service, and which operate at potentials not exceeding 400 volts to ground or 750 volts between any two points of the circuit, and the transmitted power of which does not exceed 150 watts. If the lines are operating at less than 150 volts, no limit is placed on the transmitted power of the system. Under certain conditions, communication cables may include communication circuits exceeding these limitations where such circuits are also used to supply power solely to communication equipment.

Note: Telephone, telegraph, railroad signal, data, clock, fire, police alarm, cable television, and other systems conforming with this definition are included. Lines used for signaling purposes, but not included under this definition, are considered as electric supply lines of the same voltage.

• **"Electric supply lines"** - Conductors used to transmit electric energy and their necessary supporting or containing structures. Signal lines of more than 400 volts are always supply lines within this section, and those of less than 400 volts are considered as supply lines, if so run and operated throughout.

"Live-line tools and ropes" - Tools and ropes specifically designed for work on energized high voltage lines and equipment.

"Load-break elbow" - A connector designed to close and interrupt current on energized circuits within the design current and voltage rating.

"Manhole" - A subsurface enclosure which personnel may enter and which is used for the purpose of installing, operating, and maintaining submersible equipment or cable.

"Manhole steps" - A series of steps individually attached to or set into the walls of a manhole structure.

"Minimum approach distance" - The closest distance an employee is permitted to approach an energized or a grounded object.

"Neutral" - A system in which one conductor is used as the neutral for one or more circuits; one conductor may be

used as the neutral for both primary and secondary circuits of a distribution system.

"Pole" - Any device used to support a power distribution or transmission line. The pole may be made of any substance including wood, concrete, metal, is usually cylindrical in shape and comparatively slender. It is the upright standard to which is affixed part of the power distribution and transmission line system as defined in this chapter.

"Power dispatcher" (load dispatcher or system operator) - A person who has been designated by the employer as having authority over switching and clearances of high voltage lines and station equipment.

"Protective devices" - Devices such as rubber gloves, rubber blankets, line hose, rubber boots, or other insulating devices, which are specifically designed for the protection of employees.

"Public highway" - Every way, land, road, street, boulevard, and every other way or place in the state open as a matter of right to public vehicular travel, both inside and outside the limits of cities and towns, regardless of ownership.

"Qualified person or qualified employee" - A person who is familiar with the construction of, or operation of such lines and/or equipment that concerns his/her position and who is fully aware of the hazards connected therewith, or, one who has passed a journey status examination for the particular branch of the electrical trades with which he/she may be connected.

- Note 1: An employee must have the training required by WAC 296-45-065(1) in order to be considered a qualified employee.
- Note 2: (Apprentice) Except under WAC 296-45-25510(12), an employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

"Rubber" - Any goods, equipment, or tool made out of either natural or synthetic rubber.

"Secured ladder" - A ladder which is not capable of being dislodged from the top by lateral, or jerking motion(s).

"Sheath" - As applied to tools carried in a lineman's tool belt, a sheath that effectively covers the tool and prevents such tool from falling from the belt.

"Step bolt" - A bolt or rung attached at intervals along a structural member and used for foot placement during climbing or standing.

"Supporting structure" - The main supporting unit (usually a pole or tower).

"Switch" - A device for opening and closing or for changing the connection of a circuit. In these rules, a switch is understood to be manually operable, unless otherwise stated.

"System operator or power dispatcher" - A qualified person who has been designated by the employer and having authority over switching, clearances, and operation of the system and its parts.

"Tag" - A system or method of identifying circuits, systems, or equipment for the purpose of alerting employees and others that the circuit, system, or equipment is being worked on.

"Underground network" - An underground electrical installation fed from multiple primary sources directly associated with area-wide secondary network connected into a common grid.

"Underground residential distribution system" (URD) - An electrical installation normally fed from a single primary source which may feed one or more transformers with secondaries not connected to a common grid.

"Utility" - An organization responsible for the installation, operation, or maintenance of electric supply or communications systems.

"Vault" - An enclosure, above or below ground, which personnel may enter and which is used for the purpose of installing, operating, or maintaining equipment or cable.

"Vented vault" - A vault that has provision for air changes using exhaust flue stacks and low level air intakes operating on differentials of pressure and temperature providing for airflow which precludes a hazardous atmosphere from developing.

"Voltage" - The effective (rms) potential difference between any two conductors or between a conductor and ground. Voltages are expressed in nominal values unless otherwise indicated. The nominal voltage of a system or circuit is the value assigned to a system or circuit of a given voltage class for the purpose of convenient designation. The operating voltage of the system may vary above or below this value.

- Note: Low voltage includes voltages from 50 to 600 volts. High voltage shall mean those voltages of 601 volts to 230,000. Extra high voltage means any voltage over 230,000 volts. Where the words "high voltage" are used in this chapter it shall include extra high voltage, unless otherwise specified.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-035, filed 3/6/98, effective 5/6/98.]

WAC 296-45-045 NESC applicable. (1) All electric utilities and entities operating transmission and distribution facilities within the state of Washington must design, construct, operate, and maintain their lines and equipment according to the requirements of the 1997 National Electrical Safety Code (NESC) (ANSI-C2), parts (1), (2), and (3).

- Note: The department has copies of the NESC available for review at each service location across the state. To purchase a copy, write to:
The Institute of Electrical and Electronics Engineers, Inc.
345 East 47th Street
New York, NY 10017-2394

(2) The employer must ensure that climbing space is provided on all poles and structures. The climbing space must meet the requirements of the 1997 National Electrical Safety Code (NESC) (ANSI-C2), except that Rule 236H does not apply.

[Statutory Authority: RCW 49.17.040. 99-09-080, § 296-45-045, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-045, filed 3/6/98, effective 5/6/98.]

WAC 296-45-055 Employer's responsibility. (1) The employer shall provide and maintain the necessary protective devices specified in these rules and require the employees to use them properly.

(2) The employer shall develop and maintain a hazard communication program as required by Part C, chapter 296-62 WAC, which will provide information to all employees relative to hazardous chemicals or substances to which they are exposed, or may become exposed, in the course of their employment.

(3) There shall be installed and maintained in every fixed establishment employing eight or more persons a safety bulletin board of a size to display and post safety bulletins, newsletters, posters, accident statistics and other safety educational material. It is recommended that safety bulletin boards be painted green and white.

(4) The employer shall require the leadworker to observe and enforce all safety rules and shall furnish a copy of the electrical workers' safety rules to each employee who is covered by these rules.

(5) The employer shall appoint only competent workers to supervise other employees and those appointed shall be responsible for the safety of the employees under their supervision.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-055, filed 3/6/98, effective 5/6/98.]

WAC 296-45-065 Training. Employees shall be trained and proficient in the safety-related work practices, safety procedures, and other safety requirements in this section that pertain to their respective job assignments. Employees shall also be trained in and proficient with any other safety practices, including applicable emergency procedures (such as pole top, aerial, manhole, and tree rescue), that are not specifically addressed by this section but that are related to their work and are necessary for their safety.

(1) Qualified employees shall also be trained and competent in:

(a) The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment;

(b) The skills and techniques necessary to determine the nominal voltage of exposed live parts;

(c) The minimum approach distances specified in this section corresponding to the voltages to which the qualified employee will be exposed; and

(d) The proper use of the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electric equipment.

Note: For the purposes of this section, a person must have this training in order to be considered a qualified person.

(2) The employer shall determine, through regular supervision and through inspections conducted on at least an annual basis, that each employee is complying with the safety-related work practices required by this section.

(3) An employee shall receive additional training (or retraining) under any of the following conditions:

(a) If the supervision and annual inspections required by subsection (2) of this section indicate that the employee is not complying with the safety-related work practices required by this section; or

(b) If new technology, new types of equipment, or changes in procedures necessitate the use of safety-related

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work practices that are different from those which the employee would normally use; or

(c) If he or she must employ safety related work practices that are not normally used during his or her regular job duties.

Note: WISHA would consider tasks that are performed less often than once per year to necessitate retraining before the performance of the work practices involved.

(4) The training required by WAC 296-45-065 shall be of the classroom or on-the-job type.

(5) The training shall establish employee proficiency in the work practices required by this section and shall introduce the procedures necessary for compliance with this section.

(6) The employer shall certify that each employee has received the training required by WAC 296-45-065. This certification shall be made when the employee demonstrates proficiency in the work practices involved and shall be maintained for the duration of the employee's employment.

Note: Employment records that indicate that an employee has received the required training are an acceptable means of meeting this requirement.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-065, filed 3/6/98, effective 5/6/98.]

WAC 296-45-075 Employer's safety program. (1)

The employer shall hold safety meetings at least once a month, which meetings shall be held at a reasonable time and place as selected by the employer. The employer shall require all employees subject to provisions of this chapter to attend said meetings: Provided, That employees whose presence is otherwise required by reason of an emergency or whose function is such that they cannot leave their station or cease their work without serious detriment to the service provided, such as dispatcher, may be excused from such meeting under those circumstances. Minutes shall be kept of each safety meeting and retained for a period of one year.

(2) The employer or a representative(s) designated shall investigate all accidents or injuries of a serious nature and, where possible, take the proper remedial steps to prevent the occurrence of similar accidents.

(3) The employer shall furnish instructions stating the proper procedure in event of an emergency, which shall include the names of those individuals to be notified and methods of contacting them.

(4) The employer shall provide and make available to all employees accident report and safety suggestion forms or other approved methods. Safety suggestion forms should, where possible, be used for suggesting the elimination of hazardous conditions and such reported suggestions shall be retained (for one year) by the employer or an authorized representative.

(5) The employer must notify the department of employee fatalities or catastrophes according to the requirements of WAC 296-24-020.

(6) Nothing contained within this chapter shall prohibit an employer or an authorized representative from disciplining employees for failure to comply with the provisions of this or any other safety code.

(7) Existing conditions related to the safety of the work to be performed shall be determined before work on or near electric lines or equipment is started. Such conditions include, but are not limited to, the nominal voltages of lines and equipment, the maximum switching transient voltages, the presence of hazardous induced voltages, the presence and condition of protective grounds and equipment grounding conductors, the condition of poles, environmental conditions relative to safety, and the locations of circuits and equipment, including power and communication lines and fire protective signaling circuits.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-075, filed 3/6/98, effective 5/6/98.]

WAC 296-45-085 Leadworker's responsibility. (1) Every leadworker shall understand these and any other applicable safety rules and comply therewith. Leadworkers shall require all employees under their direction or supervision to read this chapter and the provisions contained therein and require every employee subject to this chapter to be able to apply this chapter and any provision of this chapter on a day-to-day basis.

(2) Leadworkers shall inform employees under their supervision or direction of the type and voltage of circuits on or near which the employees are to work.

(3) Leadworkers shall require all employees under their supervision to properly use safety devices and equipment, including barricades, warning flags or signs, or any other device called for to protect employees.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-085, filed 3/6/98, effective 5/6/98.]

WAC 296-45-095 Leadworker-employee responsibility. (1) An employee shall protect his/her climbing and working space at all times if the conductors are so spaced that in climbing or working he/she will be, or where it is possible to come within, the minimum required distances specified in these rules.

(2) Leadworkers or supervisors shall in good faith consider verbal or written reports of hazardous conditions and shall, as soon as practicable, investigate and remedy same if warranted.

(3) When hazards are reported by employees, leadworkers and others having authority shall accept the report in a cooperative manner, and in no case shall an employee be reprimanded or penalized for reporting hazards or potential hazards.

(4) Leadworkers shall require all employees under their supervision to keep their belts, spurs, and straps in good working condition. When straps and belts are in poor condition or defective, they shall not be used.

(5) Before leaving a jobsite, leadworkers shall correct or arrange to give warning of any condition which might result in injury to employees.

(6) No employee shall be permitted or allowed to remain on the jobsite when under the influence of any intoxicating beverage or controlled substance or substances: Provided, That if an employee is taking prescription medication under the direction of a practicing physician and such prescription

does not interfere with the safe performance of the work assigned, such employee may be permitted to work.

(7) No intoxicating beverages or controlled substances shall be consumed on the jobsite other than prescription medication as set forth above.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-095, filed 3/6/98, effective 5/6/98.]

WAC 296-45-105 Work required of leadworkers. (1) A leadworker cannot properly supervise the work and look out for the safety of employees under their direction if required to work as a leadworker and a lineworker at the same time.

(2) Leadworkers should be constantly alert and shall not be required to serve in such dual capacity, except in crews of not more than two lineworkers, in which case they may work as one of the lineworkers.

(3) In crews of two lineworkers or less, each lineworker may have a groundworker but, if additional lineworkers or groundworkers are added to the crew, the leadworker shall confine his/her activities to supervising the work, as exhibited below:

Type of Crew	Minimum Requirements
2 lineworkers	One lineworker as person-in-charge.
2 lineworkers plus 1 groundworker	One lineworker as person-in-charge or climbing leadworker.
2 lineworkers plus 2 groundworkers	One lineworker as person-in-charge or climbing leadworker.
2 lineworkers plus any combination of 3 lineworkers or groundworkers	One nonclimbing leadworker.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-105, filed 3/6/98, effective 5/6/98.]

WAC 296-45-115 Employee's responsibility. (1) Employees shall not engage in horseplay or scuffling while on the job or jobsite and the employer shall not permit horseplay or scuffling while on the jobsite or otherwise in the course of employment.

(2) During such time as any employee is working on or near any energized line or energized equipment in excess of 600 volts there shall be no talking or communication other than that which is absolutely necessary and essential for the safe and proper performance of the work. Should there be communication or talk from a person other than an employee, the work shall stop until such time as the distraction ceases.

(3) Employees shall report any hazardous or potentially hazardous condition, operation, means, or work in a constructive manner and shall not engage in personality conflicts.

(4) Neither the employer nor the employees shall throw or permit anything to be thrown from elevated position(s) or poles to the ground or lower level, nor shall anything be thrown from the ground or lower level to an elevated position, whether that elevated position is on a pole, aerial manlift or otherwise. Tools and loose materials shall not be left on poles, crossarms, ladders or other elevated structures or positions.

(5) Employees shall report all injuries, regardless of severity, to the employer or designated representative. Report forms furnished by the employer should be used.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-115, filed 3/6/98, effective 5/6/98.]

WAC 296-45-125 Medical services and first aid. The employer shall provide medical services and first aid as required in chapter 296-24 WAC. In addition to the requirements of chapter 296-24 WAC, the following requirements also apply:

(1) Cardiopulmonary resuscitation and first-aid training. When employees are performing work on or associated with exposed lines or equipment energized at 50 volts or more, persons trained in first aid including cardiopulmonary resuscitation (CPR) shall be available as follows:

(a) For field work involving two or more employees at a work location, at least two trained persons shall be available. However, only one trained person need be available if all new employees are trained in first aid, including CPR, within 3 months of their hiring dates.

(b) For fixed work locations such as generating stations, the number of trained persons available shall be sufficient to ensure that each employee exposed to electric shock can be reached within 4 minutes by a trained person. However, where the existing number of employees is insufficient to meet this requirement (at a remote substation, for example), all employees at the work location shall be trained.

(2) First-aid supplies. First-aid supplies required by chapter 296-24 WAC shall be placed in weatherproof containers if the supplies could be exposed to the weather.

(3) First-aid kits. Each first-aid kit shall be maintained, shall be readily available for use, and shall be inspected frequently enough to ensure that expended items are replaced but at least once per year.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-125, filed 3/6/98, effective 5/6/98.]

WAC 296-45-135 Job briefing. The employer shall ensure that the leadworker conducts a job briefing with the employees involved before they start each job. The briefing shall cover at least the following subjects: Hazards associated with the job, work procedures involved, special precautions, energy source controls, and personal protective equipment requirements.

(1) Number of briefings. If the work or operations to be performed during the work day or shift are repetitive and similar, at least one job briefing shall be conducted before the start of the first job of each day or shift. Additional job briefings shall be held if significant changes, which might affect the safety of the employees, occur during the course of the work.

(2) Extent of briefing. A brief discussion is satisfactory if the work involved is routine and if the employee, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job. A more extensive discussion shall be conducted:

(a) If the work is complicated or particularly hazardous; or

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(b) If the employee cannot be expected to recognize and avoid the hazards involved in the job.

Note: The briefing is always required to touch on all the subjects listed in the introductory text to this section.

(3) Working alone. An employee working alone need not conduct a job briefing. However, the employer shall ensure that the tasks to be performed are planned as if a briefing were required.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-135, filed 3/6/98, effective 5/6/98.]

WAC 296-45-175 Hazardous energy control (lockout/tagout) procedures. The provisions of this section apply to the use of lockout/tagout procedures for the control of energy sources in installations for the purpose of electric power generation, including related equipment for communication or metering. Locking and tagging procedures for the de-energizing of electric energy sources which are used exclusively for purposes of transmission and distribution are addressed by WAC 296-45-335.

Note 1: Installations in electric power generation facilities that are not an integral part of, or inextricably commingled with, power generation processes or equipment are covered under chapter 296-24 WAC.

Note 2: Lockout and tagging procedures that comply with chapter 296-24 WAC will also be deemed to comply with this section if the procedures address the hazards covered by this section.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-175, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17505 Lockout/tagout (hazardous control) program. (1) The employer shall establish a program consisting of energy control procedures, employee training, and periodic inspections to ensure that, before any employee performs any servicing or maintenance on a machine or equipment where the unexpected energizing, start up, or release of stored energy could occur and cause injury, the machine or equipment is isolated from the energy source and rendered inoperative.

(2) The employer's energy control program under this section shall meet the following requirements:

(a) If an energy isolating device is not capable of being locked out, the employer's program shall use a tagout system.

(b) If an energy isolating device is capable of being locked out, the employer's program shall use lockout, unless the employer can demonstrate that the use of a tagout system will provide full employee protection as follows:

(i) When a tagout device is used on an energy isolating device which is capable of being locked out, the tagout device shall be attached at the same location that the lockout device would have been attached, and the employer shall demonstrate that the tagout program will provide a level of safety equivalent to that obtained by the use of a lockout program.

(ii) In demonstrating that a level of safety is achieved in the tagout program equivalent to the level of safety obtained by the use of a lockout program, the employer shall demonstrate full compliance with all tagout-related provisions of this standard together with such additional elements as are necessary to provide the equivalent safety available from the

use of a lockout device. Additional means to be considered as part of the demonstration of full employee protection shall include the implementation of additional safety measures such as the removal of an isolating circuit element, blocking of a controlling switch, opening of an extra disconnecting device, or the removal of a valve handle to reduce the likelihood of inadvertent energizing.

(3) Whenever replacement or major repair, renovation, or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machines or equipment shall be designed to accept a lockout device.

(4) Procedures shall be developed, documented, and used for the control of potentially hazardous energy covered by this section.

(5) The procedure shall clearly and specifically outline the scope, purpose, responsibility, authorization, rules, and techniques to be applied to the control of hazardous energy, and the measures to enforce compliance including, but not limited to, the following:

(a) A specific statement of the intended use of this procedure;

(b) Specific procedural steps for shutting down, isolating, blocking and securing machines or equipment to control hazardous energy;

(c) Specific procedural steps for the placement, removal, and transfer of lockout devices or tagout devices and the responsibility for them; and

(d) Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

(6) The employer shall conduct a periodic inspection of the energy control procedure at least annually to ensure that the procedure and the provisions of this section are being followed.

(a) The periodic inspection shall be performed by an authorized employee who is not using the energy control procedure being inspected.

(b) The periodic inspection shall be designed to identify and correct any deviations or inadequacies.

(c) If lockout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

(d) Where tagout is used for energy control, the periodic inspection shall include a review, between the inspector and each authorized and affected employee, of that employee's responsibilities under the energy control procedure being inspected, and the elements set forth in this section.

(e) The employer shall certify that the inspections required by this section have been accomplished. The certification shall identify the machine or equipment on which the energy control procedure was being used, the date of the inspection, the employees included in the inspection, and the person performing the inspection.

Note: If normal work schedule and operation records demonstrate adequate inspection activity and contain the required information, no additional certification is required.

(7) The employer shall provide training to ensure that the purpose and function of the energy control program are

understood by employees and that the knowledge and skills required for the safe application, usage, and removal of energy controls are acquired by employees. The training shall include the following:

(a) Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of energy available in the workplace, and in the methods and means necessary for energy isolation and control.

(b) Each affected employee shall be instructed in the purpose and use of the energy control procedure.

(c) All other employees whose work operations are or may be in an area where energy control procedures may be used shall be instructed about the procedures and about the prohibition relating to attempts to restart or reenergize machines or equipment that are locked out or tagged out.

(8) When tagout systems are used, employees shall also be trained in the following limitations of tags:

(a) Tags are essentially warning devices affixed to energy isolating devices and do not provide the physical restraint on those devices that is provided by a lock.

(b) When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

(c) Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

(d) Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

(e) Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

(f) Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060, 98-07-009, § 296-45-17505, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17510 Retraining. (1) Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment, or processes that present a new hazard or whenever there is a change in the energy control procedures.

(2) Retraining shall also be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in an employee's knowledge or use of the energy control procedures.

(3) The retraining shall reestablish employee proficiency and shall introduce new or revised control methods and procedures, as necessary.

(4) The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17510, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17515 Protective materials and hardware. (1) Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided by the employer for isolating, securing, or blocking of machines or equipment from energy sources.

(2) Lockout devices and tagout devices shall be singularly identified; shall be the only devices used for controlling energy; may not be used for other purposes; and shall meet the following requirements:

(a) Lockout devices and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

(b) Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

(c) Tagout devices shall be so constructed as not to deteriorate when used in corrosive environments.

(3) Lockout devices and tagout devices shall be standardized within the facility in at least one of the following criteria: Color, shape, size. Additionally, in the case of tagout devices, print and format shall be standardized.

(4) Lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or metal cutting tools.

(5) Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be of a nonreusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than fifty pounds and shall have the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.

(6) Each lockout device or tagout device shall include provisions for the identification of the employee applying the device.

(7) Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as the following: Do Not Start, Do Not Open, Do Not Close, Do Not Energize, Do Not Operate.

Note: For specific provisions covering accident prevention tags, see chapter 296-24 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17515, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17520 Energy isolation. Lockout and tagout device application and removal may only be performed by the authorized employees who are performing the servicing or maintenance.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17520, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17525 Notification. Affected employees shall be notified by the employer or authorized employee of the application and removal of lockout or tagout devices.

(2001 Ed.)

Notification shall be given before the controls are applied and after they are removed from the machine or equipment.

Note: This section requires that the second notification take place before the machine or equipment is reenergized.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17525, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17530 Lockout/tagout application. The established procedures for the application of energy control (the lockout or tagout procedures) shall include the following elements and actions, and these procedures shall be performed in the following sequence:

(1) Before an authorized or affected employee turns off a machine or equipment, the authorized employee shall have knowledge of the type and magnitude of the energy, the hazards of the energy to be controlled, and the method or means to control the energy.

(2) The machine or equipment shall be turned off or shut down using the procedures established for the machine or equipment. An orderly shutdown shall be used to avoid any additional or increased hazards to employees as a result of the equipment stoppage.

(3) All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated in such a manner as to isolate the machine or equipment from energy sources.

(4) Lockout or tagout devices shall be affixed to each energy isolating device by authorized employees.

(a) Lockout devices shall be attached in a manner that will hold the energy isolating devices in a "safe" or "off" position.

(b) Tagout devices shall be affixed in such a manner as will clearly indicate that the operation or movement of energy isolating devices from the "safe" or "off" position is prohibited.

(5) Where tagout devices are used with energy isolating devices designed with the capability of being locked out, the tag attachment shall be fastened at the same point at which the lock would have been attached.

(6) Where a tag cannot be affixed directly to the energy isolating device, the tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17530, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17535 Releasing stored energy. Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, or otherwise rendered safe.

(1) If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed or until the possibility of such accumulation no longer exists.

(2) Before starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and de-energizing of the machine or equipment have been accomplished. If normally energized parts will be exposed to contact by an employee while the

machine or equipment is de-energized, a test shall be performed to ensure that these parts are de-energized.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17535, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17540 Release from lockout/tagout.

Before lockout or tagout devices are removed and energy is restored to the machine or equipment, procedures shall be followed and actions taken by the authorized employees to ensure the following:

(1) The work area shall be inspected to ensure that non-essential items have been removed and that machine or equipment components are operationally intact.

(2) The work area shall be checked to ensure that all employees have been safely positioned or removed.

(3) After lockout or tagout devices have been removed and before a machine or equipment is started, affected employees shall be notified that the lockout or tagout devices have been removed.

(4) Each lockout or tagout device shall be removed from each energy isolating device by the authorized employee who applied the lockout or tagout device. However, if that employee is not available to remove it, the device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented, and incorporated into the employer's energy control program. The employer shall demonstrate that the specific procedure provides a degree of safety equivalent to that provided by the removal of the device by the authorized employee who applied it. The specific procedure shall include at least the following elements:

(a) Verification by the employer that the authorized employee who applied the device is not at the facility;

(b) Making all reasonable efforts to contact the authorized employee to inform him or her that his or her lockout or tagout device has been removed; and

(c) Ensuring that the authorized employee has this knowledge before he or she resumes work at that facility.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17540, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17545 Temporary removal of lockout/tagout. If the lockout or tagout devices must be temporarily removed from energy isolating devices and the machine or equipment must be energized to test or position the machine, equipment, or component thereof, the following sequence of actions shall be followed:

(1) Clear the machine or equipment of tools and materials in accordance with this section;

(2) Remove employees from the machine or equipment area in accordance with this section;

(3) Remove the lockout or tagout devices as specified in this section;

(4) Energize and proceed with the testing or positioning; and

(5) De-energize all systems and reapply energy control measures in accordance with this section to continue the servicing or maintenance.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17545, filed 3/6/98, effective 5/6/98.]

[Title 296 WAC—p. 1092]

WAC 296-45-17550 Group lockout/tagout. When servicing or maintenance is performed by a crew, craft, department, or other group, they shall use a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device. Group lockout or tagout devices shall be used in accordance with the procedures required by the following specific requirements:

(1) Primary responsibility shall be vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device (such as an operations lock);

(2) Provision shall be made for the authorized employee to ascertain the exposure status of all individual group members with regard to the lockout or tagout of the machine or equipment;

(3) When more than one crew, craft, department, or other group is involved, assignment of overall job-associated lockout or tagout control responsibility shall be given to an authorized employee designated to coordinate affected work forces and ensure continuity of protection; and

(4) Each authorized employee shall affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

[Statutory Authority: RCW 49.17.040, 99-09-080, § 296-45-17550, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17550, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17555 Shift changes. Procedures shall be used during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout device protection between off-going and on-coming employees, to minimize their exposure to hazards from the unexpected energizing or start-up of the machine or equipment or from the release of stored energy.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17555, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17560 Outside servicing personnel. Whenever outside servicing personnel are to be engaged in activities covered by this section, the on-site employer and the outside employer shall inform each other of their respective lockout or tagout procedures, and each employer shall ensure that his or her personnel understand and comply with restrictions and prohibitions of the energy control procedures being used.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17560, filed 3/6/98, effective 5/6/98.]

WAC 296-45-17565 Central system operator. If energy isolating devices are installed in a central location under the exclusive control of a system operator, the following requirements apply:

(1) The employer shall use a procedure that affords employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

(2001 Ed.)

(2) The system operator shall place and remove lockout and tagout devices in place of the authorized employee.

(3) Provisions shall be made to identify the authorized employee who is responsible for (that is, being protected by) the lockout or tagout device, to transfer responsibility for lockout and tagout devices, and to ensure that an authorized employee requesting removal or transfer of a lockout or tagout device is the one responsible for it before the device is removed or transferred.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-17565, filed 3/6/98, effective 5/6/98.]

WAC 296-45-195 Trenching and excavation. (1) During excavation or trenching, in order to prevent exposure of employees to the hazards created by damage to dangerous underground facilities, efforts shall be made to determine the location of such facilities and work conducted in a manner designed to avoid damage.

(2) Trenching and excavation operations shall comply with the provisions of Part N, chapter 296-155 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-195, filed 3/6/98, effective 5/6/98.]

WAC 296-45-205 Enclosed spaces. This section covers enclosed spaces that may be entered by employees. It does not apply to vented vaults if a determination is made that the ventilation system is operating to protect employees before they enter the space. This paragraph applies to routine entry into enclosed spaces in lieu of the permit-space entry requirements contained in WAC 296-62-145. If, after the precautions given in WAC 296-45-205, 296-45-215, and 296-45-225 are taken, the hazards remaining in the enclosed space endanger the life of an entrant or could interfere with escape from the space, then entry into the enclosed space shall meet the permit-space entry requirements of WAC 296-62-145.

Note: Entries into enclosed spaces conducted in accordance with the permit-space entry requirements of WAC 296-62-145 are considered as complying with this section.

(1) "Safe work practices." The employer shall ensure the use of safe work practices for entry into and work in enclosed spaces and for rescue of employees from such spaces.

(2) "Training." Employees who enter enclosed spaces or who serve as attendants shall be trained in the hazards of enclosed space entry, in enclosed space entry procedures, and in enclosed space rescue procedures.

(3) "Rescue equipment." Employers shall provide equipment to ensure the prompt and safe rescue of employees from the enclosed space.

(4) "Evaluation of potential hazards." Before any entrance cover to an enclosed space is removed, the employer shall determine whether it is safe to do so by checking for the presence of any atmospheric pressure or temperature differences and by evaluating whether there might be a hazardous atmosphere in the space. Any conditions making it unsafe to remove the cover shall be eliminated before the cover is removed.

Note: The evaluation called for in this subsection may take the form of a check of the conditions expected to be in the enclosed space. For example, the cover could be checked to see if it is hot and, if it is fastened in place, could be loos-

ened gradually to release any residual pressure. A determination must also be made of whether conditions at the site could cause a hazardous atmosphere, such as an oxygen deficient or flammable atmosphere, to develop within the space.

(5) "Removal of covers." When covers are removed from enclosed spaces, the opening shall be promptly guarded by a railing, temporary cover, or other barrier intended to prevent an accidental fall through the opening and to protect employees working in the space from objects entering the space.

(6) "Hazardous atmosphere." Employees may not enter any enclosed space while it contains a hazardous atmosphere, unless the entry conforms to the generic permit-required confined spaces standard in WAC 296-62-145 through 296-62-14543.

Note: The term "entry" is defined in WAC 296-62-14501.

(7) "Attendants." While work is being performed in the enclosed space, a person with first-aid training meeting WAC 296-45-125 shall be immediately available outside the enclosed space to render emergency assistance if there is reason to believe that a hazard may exist in the space or if a hazard exists because of traffic patterns in the area of the opening used for entry. That person is not precluded from performing other duties outside the enclosed space if these duties do not distract the attendant from monitoring employees within the space.

Note: See WAC 296-45-215(12) for additional requirements on attendants for work in manholes.

(8) "Calibration of test instruments." Test instruments used to monitor atmospheres in enclosed spaces shall be kept in calibration, with a minimum accuracy of + or - 10 percent.

(9) "Testing for oxygen deficiency." Before an employee enters an enclosed space, the internal atmosphere shall be tested for oxygen deficiency with a direct-reading meter or similar instrument, capable of collection and immediate analysis of data samples without the need for off-site evaluation. If continuous forced air ventilation is provided, testing is not required provided that the procedures used ensure that employees are not exposed to the hazards posed by oxygen deficiency.

(10) "Testing for flammable gases and vapors." Before an employee enters an enclosed space, the internal atmosphere shall be tested for flammable gases and vapors with a direct-reading meter or similar instrument capable of collection and immediate analysis of data samples without the need for off-site evaluation. This test shall be performed after the oxygen testing and ventilation required by subsection (9) of this section demonstrate that there is sufficient oxygen to ensure the accuracy of the test for flammability.

(11) "Ventilation and monitoring." If flammable gases or vapors are detected or if an oxygen deficiency is found, forced air ventilation shall be used to maintain oxygen at a safe level and to prevent a hazardous concentration of flammable gases and vapors from accumulating. A continuous monitoring program to ensure that no increase in flammable gas or vapor concentration occurs may be followed in lieu of ventilation, if flammable gases or vapors are detected at safe levels.

Note: See the definition of hazardous atmosphere for guidance in determining whether or not a given concentration of a substance is considered to be hazardous.

(12) "Specific ventilation requirements." If continuous forced air ventilation is used, it shall begin before entry is made and shall be maintained long enough to ensure that a safe atmosphere exists before employees are allowed to enter the work area. The forced air ventilation shall be so directed as to ventilate the immediate area where employees are present within the enclosed space and shall continue until all employees leave the enclosed space.

(13) "Air supply." The air supply for the continuous forced air ventilation shall be from a clean source and may not increase the hazards in the enclosed space.

(14) "Open flames." If open flames are used in enclosed spaces, a test for flammable gases and vapors shall be made immediately before the open flame device is used and at least once per hour while the device is used in the space. Testing shall be conducted more frequently if conditions present in the enclosed space indicate that once per hour is insufficient to detect hazardous accumulations of flammable gases or vapors.

Note: See the definition of hazardous atmosphere for guidance in determining whether or not a given concentration of a substance is considered to be hazardous.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-205, filed 3/6/98, effective 5/6/98.]

WAC 296-45-215 Underground electrical installations. This section provides additional requirements for work on underground electrical installations.

(1) Protective barriers, or approved guards and warning signs must be erected before removing manhole covers or making excavations in places accessible to vehicular or pedestrian traffic.

(2) Whenever an opening is made in the street, it shall be properly guarded or covered until same is closed and whenever an obstruction is left in the roadway after dark, it shall be marked with approved lights, flares or similar devices.

(3) Access. A ladder or other climbing device shall be used to enter and exit a manhole or subsurface vault exceeding 4 feet (122 cm) in depth. No employee may climb into or out of a manhole or vault by stepping on cables or hangers.

(4) When work is to be performed in a manhole or unvented vault:

(a) No entry shall be permitted unless the atmosphere is found to be safe by testing for the presence of explosive or potentially hazardous gases or fumes.

(b) No entry shall be permitted unless the atmosphere has been found safe by testing for oxygen deficiency or forced ventilation is provided.

(c) When unsafe conditions are detected, by testing or other means, the work area shall be ventilated and otherwise made safe before entry.

(d) Provisions shall be made for a continuous supply of air as provided for in Part L, chapter 296-62 WAC.

(e) When forced ventilation is not used a method of monitoring said manhole or vault so as to prevent the occurrence of oxygen deficiency due to work being performed in said manhole or vault, and to detect the presence of any explosive

gases or fumes which may occur while the employees are working in said manhole or vault.

(5) When open flames are used or smoking is permitted in manholes, adequate mechanical forced air ventilation shall be used.

(6) Before using open flames in a manhole or excavation in an area where combustible gases or liquids may be present, such as near a gasoline service station, the atmosphere of the manhole or excavation shall be tested and found safe or cleared of the combustible gases or liquids prior to the entry.

(7) When work is to be performed in manholes containing any wires or appliances carrying electrical current, they shall be in a sanitary condition.

(8) Care shall be taken to prevent the possibility of vehicles or pedestrians coming in contact with the wires and equipment.

(9) Lowering equipment into manholes. Equipment used to lower materials and tools into manholes or vaults shall be capable of supporting the weight to be lowered and shall be checked for defects before use. Before tools or materials are lowered into the opening for a manhole or vault, each employee working in the manhole or vault shall be clear of the area directly under the opening.

(10) Materials shall not be thrown into or out of manholes but shall be placed in the proper receptacle and hoisted in and out by means of a rope.

(11) Tools and materials shall not be left on the ground around or near the manhole opening where they might be pushed or otherwise fall into the hole.

(12) Attendants for manholes.

(a) An attendant shall be kept at the surface when there is any hazard to the employees in the manhole and the attendant should not leave the manhole unwatched until such time as all employees are out and the cover has been replaced.

(b) While work is being performed in a manhole containing energized electric equipment, an employee with first aid and CPR training meeting WAC 296-45-125(1) shall be available on the surface in the immediate vicinity to render emergency assistance.

Note 1: An attendant may also be required under WAC 296-45-205(7). One person may serve to fulfill both requirements. However, attendants required under WAC 296-45-205(7) are not permitted to enter the manhole.

Note 2: Employees entering manholes containing unguarded, uninsulated energized lines or parts of electric equipment operating at 50 volts or more are required to be qualified under WAC 296-45-325(1) through (4).

(c) No work shall be permitted to be done in any manhole or subway on any energized wire, cable or appliance carrying more than 300 volts of electricity by less than two qualified persons who shall at all times, while performing such work, be in the same manhole or subway in which work is being done. This rule shall not apply to work on telephone, telegraph or signal wires or cables.

(d) For the purpose of inspection, housekeeping, taking readings, or similar work, an employee working alone may enter, for brief periods of time, a manhole where energized cables or equipment are in service, if the employer can demonstrate that the employee will be protected from all electrical hazards.

(e) Reliable communications, through two-way radios or other equivalent means, shall be maintained among all employees involved in the job.

(13) Cable in manholes or underground vaults shall be accessible to employees and a clear working space shall be maintained at all times; and/or approved protective guards, barriers, etc., when installed shall be considered as providing adequate working clearance for cables over 5 k.v. If a manhole and/or underground vault is determined to have an electrical or structural hazard, no work shall be done in the manhole and/or vault until the unsafe condition is corrected or de-energized.

(14) No work shall be performed on cables or equipment unless they have been properly identified by an approved method.

(15) Duct rods. If duct rods are used, they shall be installed in the direction presenting the least hazard to employees. An employee shall be stationed at the far end of the duct line being rodded to ensure that the required minimum approach distances are maintained.

(16) Multiple cables. When multiple cables are present in a work area, the cable to be worked shall be identified by electrical means, unless its identity is obvious by reason of distinctive appearance or location or by other readily apparent means of identification. Cables other than the one being worked shall be protected from damage.

(17) Before cutting into a high voltage cable or opening a high voltage splice, the cable shall be de-energized then clearance obtained, tested and then grounded in an approved manner. The cable to be worked on shall be identified by tags or equivalent means.

(18) Moving cables. Energized cables that are to be moved shall be inspected for defects.

(19) Insulated platforms or other protective devices shall be provided when work is to be done on energized wires or equipment in manholes.

(20) Furnaces shall always be placed in a secure, level position on the downhill side of the manhole to avoid spillage of hot metals or compounds into the manhole.

(21) Pulling underground cable. When pulling cable(s) all employees shall be made aware of the hazard of being caught in the sheaves, lashings or winch gears. All employees shall stand clear of the pulling line when the pull is begun or when the line is under tension. This rule applies to all work performed by means of a winch.

(22) Fishing conduit or ducts. When fishing conduit or ducts, it shall first be determined that the fish tape or wires will not contact any energized line or equipment.

(23) WAC 296-45-335 on clearances shall be complied with. Also WAC 296-45-345 and/or WAC 296-45-355 on grounding shall be complied with.

(24) Defective cables. Where a cable in a manhole has one or more abnormalities that could lead to or be an indication of an impending fault, the defective cable shall be de-energized before any employee may work in the manhole, except when service load conditions and a lack of feasible alternatives require that the cable remain energized. In that case, employees may enter the manhole provided they are protected from the possible effects of a failure by shields or

other devices that are capable of containing the adverse effects of a fault in the joint.

Note: Abnormalities such as oil or compound leaking from cables or joints, broken cable sheaths or joint sleeves, hot localized surface temperatures of cables or joints, or joints that are swollen beyond normal tolerance are presumed to lead to or be an indication of an impending fault.

(25) Sheath continuity. When work is performed on buried cable or on cable in manholes, metallic sheath continuity shall be maintained by bonding across the opening (or by equivalent means), or the cable sheath shall be treated as energized.

[Statutory Authority: RCW 49.17.040, 99-09-080, § 296-45-215, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-215, filed 3/6/98, effective 5/6/98.]

WAC 296-45-225 Underground residential distribution (URD). (1) General.

(a) Each employee shall be knowledgeable of the equipment provided for their use and shall at all times use this equipment only for the purpose intended.

(b) U.R.D. cables which are properly insulated for the voltages to which they are energized shall be considered as an effective barrier to protect the employees and table one need not apply.

(i) Workers will take adequate precautions to avoid physical contact with energized U.R.D. cable by using approved procedures and/or protective devices.

(ii) When handling energized U.R.D. primary cables, the work shall be done with approved tools and/or procedures by two qualified employees. Switching is exempt from this rule.

(iii) When energized terminators or load-break elbows are handled by a hot stick, there shall be two qualified employees at the scene.

(c) When energized pad-mounted transformers or similar equipment are to be left unlocked and open, they shall be attended by a qualified employee.

(d) Approved tools and procedures shall be used to remove any debris, vines, weeds, etc., from an underground system.

(e) A primary and secondary system neutral on any energized circuit shall not be opened under any circumstances except for testing.

(f) Primary and secondary neutrals shall be firmly connected and grounded before the circuit or equipment is energized.

(g) Where different phases are in the same vault, enclosures, or parked in some manner that they could be looped, these phases shall be marked or identified.

(h) Bayonet fuses:

(i) Bayonet fuses shall not be closed into suspected faults or overloads.

(ii) Submersible U.G. transformer installations will require other methods of energizing or de-energizing and bayonet fuses shall not be used for this purpose.

(iii) Bayonet fuses shall only be operated after pad-mount transformers have been properly vented.

(iv) Bayonet fuses shall only be operated in accordance with manufacturing design and rating capabilities.

(2) Working on cables.

(a) Before any work is to be performed on underground cables and apparatus carrying high voltage, they shall be de-energized with the following exceptions:

(i) Replacing fuses, operating switches, closing or opening load-break elbows, when approved protective devices are used.

(ii) Work in the high-voltage compartment of pad-mounted transformers and similar equipment installed above ground, provided the work is done by approved methods.

(b) Only one energized conductor shall be worked on at any one time, and protective means shall be used to insulate or isolate it from all others.

(c) When work is to be performed in manholes containing any wires or appliances carrying electrical current, they shall be in a sanitary condition.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-225, filed 3/6/98, effective 5/6/98.]

WAC 296-45-255 Protective equipment. (1) Rubber protective equipment shall be in accordance and tested as follows:

Item	Standard
Rubber Insulating Gloves	(ASTM) D 120-87
Rubber Matting for Use Around Electrical Apparatus	(ASTM) D 178-88
Rubber Insulating Blankets	(ASTM) D 1046-88a
Rubber Insulating Hoods	(ASTM) D 1049-88
Rubber Insulating Line Hose	(ASTM) D 1050-90
Rubber Insulating Sleeves	(ASTM) D 1051-87

(2) No protective equipment or material other than rubber shall be used: Provided, That such other nonconductive equipment may be used if it provides equal or better (dielectric) electrical and mechanical protection than rubber protective equipment: Provided, That the employer obtain before placing in service, manufacturer's data or other data to demonstrate that such nonrubber protective equipment provided equal or better electrical and mechanical protection than approved rubber equipment.

(3) Protective equipment shall not be used at voltages in excess of that for which the manufacturer has supplied data to the employer demonstrating that it is fit for such voltages.

(4) No protective equipment shall be modified, altered, or used for purposes other than those for which it is designed unless and until the manufacturer has, in writing, agreed or suggested that there be such modification, alteration, or use.

(5) Each rubber glove before it is used shall be inspected for defects and an approved air test performed. If, upon inspection, rubber gloves are either defective or appear to be defective, they shall not be used.

(6) Before being placed in service, all rubber protective equipment shall be numbered and records kept for test purposes and assignment.

(7) Rubber protective equipment shall not be used unless it has been dielectrically tested within six months and bears marking or identification of the date of the test or the expiration date.

(8) Protector gloves must be worn over insulating gloves.

EXCEPTION: Protector gloves need not be used with Class 0 gloves, under limited-use conditions, where small equipment and parts manipulation necessitate unusually high finger dexterity.

Note: Extra care is needed in the visual examination of the glove and in the avoidance of handling sharp objects.

(9) Rubber gloves when not in use shall be carried in an approved bag provided and designed for that purpose. It shall be provided by the employer and made available to the employees.

(10) Approved rubber gloves and carrying bag shall be assigned to each employee who works with, or is exposed to energized parts.

(11) Rubber protective equipment shall not be vulcanized or patched.

(12) A compartment or box shall be provided on each electric line truck, which box or compartment shall be used for storing rubber protective equipment. No equipment shall be stored in said compartment or box which can or could cause damage to the rubber equipment or goods placed in the compartment or box. Additionally, a separate container or compartment shall be provided for rubber blankets.

(13) Line hose shall not be doubled on themselves at any time. All blankets before storage must be wiped clean and rolled, not folded, before being placed in the container or box.

(14) Protective line equipment of material other than rubber shall be kept clean and visually inspected before each use.

(15) If protective line equipment of material other than rubber is found to be substantially defective or unsuitable for the purpose for which it is designed and intended, said protective line equipment shall not be used for personal protection of employees as may be required in Table 1 of this chapter. Said protective line equipment shall be marked defective but may be otherwise used unless the defect or damage to said protective line equipment creates additional safety hazards.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-255, filed 3/6/98, effective 5/6/98.]

WAC 296-45-25505 Personal protective equipment.

(1) General. Personal protective equipment shall meet the requirements of chapter 296-24 WAC, Part A-2.

(2) All protective hats shall be in accordance with the specifications of ANSI Z89.2-1971 Edition Industrial Protective Helmets for Electrical Workers, Class B, and shall be worn at the jobsite by employees who are exposed to overhead or electrical hazards.

(3) Wearing apparel. Goggles, hearing protection, respirators, rubber gloves, and other such personal protective devices shall not be interchanged among employees unless they have been sanitized.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-25505, filed 3/6/98, effective 5/6/98.]

WAC 296-45-25510 Fall protection. (1) Personal fall arrest equipment shall meet the requirements of WAC 296-155-245.

(2) Body belts and safety straps for work positioning shall meet the requirements of WAC 296-155-245.

(3) Body belts, safety straps, lanyards, lifelines, and body harnesses shall be inspected before use each day to determine that the equipment is in safe working condition. Defective equipment may not be used.

(4) Employees shall not wear climbers while doing work where they are not required. Employees shall not continue to wear their climbers while working on the ground; except for momentary or short periods of time on the ground.

(5) Employees, when working from a hook ladder, must either belt themselves securely to the ladder, attach themselves to the structures by means of a safety line, or belt themselves to ladder safety equipment, which shall consist of a safety rope or belting threaded through the rungs or secured to the ladder at intervals of not more than three feet.

(6) Before an employee throws his/her weight on a belt, the employee shall determine that the snap or fasteners are properly engaged.

(7) Safety straps shall not be placed around poles above the cross-arm except where it is not possible for the strap to slide or be slipped over the top of the pole by inadvertence of the employee. Neither end of the strap shall be allowed to hang loose or dangle while the employee is ascending or descending poles or other structures.

(8) Body belts and safety straps shall not be stored with sharp-edged tools or near sharp objects. When a body belt, safety strap and climbers are kept in the same container, they shall be stored in such a manner as to avoid cutting or puncturing the material of the body belt or safety strap with the gaffs or climbers.

(9) Employees shall not attach metal hooks or other metal devices to body belts. Leather straps or rawhide thongs shall have hardwood or fibre crossbars. Leather straps and rawhide thongs shall not have metal or other conductive crossbars on them.

(10) Climbing gaffs shall be kept properly sharpened and shall be at least 1-1/8 inches in length.

(11) Lifelines shall be protected against being cut or abraded.

(12) Fall arrest equipment, work positioning equipment, or travel restricting equipment shall be used by employees working at elevated locations more than 4 feet (1.2 m) above the ground on poles, towers, or similar structures if other fall protection has not been provided. Fall protection equipment is not required to be used by a qualified employee climbing or changing location on poles, towers, or similar structures, unless conditions, such as, but not limited to, ice, high winds, the design of the structure (for example, no provision for holding on with hands), or the presence of contaminants on the structure, could cause the employee to lose his or her grip or footing.

Note 1: This subsection applies to structures that support overhead electric power generation, transmission, and distribution lines and equipment. It does not apply to portions of buildings, such as loading docks, to electric equipment, such as transformers and capacitors, nor to aerial lifts. Requirements for fall protection associated with walking and working surfaces are contained in WAC 296-155-245; requirements for fall protection associated with aerial lifts are contained in chapter 296-155 WAC, Part J-1.

Note 2: Employees undergoing training are not considered "qualified employees" for the purposes of this provision. Unqualified employees (including trainees) are required to use fall protection any time they are more than 4 feet (1.2 m) above the ground.

(13) The following requirements apply to personal fall arrest systems:

(a) When stopping or arresting a fall, personal fall arrest systems shall limit the maximum arresting force on an employee to 1800 pounds (8 kN) if used with a body harness.

(b) Personal fall arrest systems shall be rigged such that an employee can neither free fall more than 6 feet (1.8 m) nor contact any lower level.

(14) If vertical lifelines or droplines are used, not more than one employee may be attached to any one lifeline.

(15) Snaphooks may not be connected to loops made in webbing-type lanyards.

(16) Snaphooks may not be connected to each other.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-25510, filed 3/6/98, effective 5/6/98.]

WAC 296-45-275 Ladders, platforms, and manhole steps. (1) General. Requirements for ladders contained in chapter 296-24 WAC, Part J-1, apply, except as specifically noted in subsection (2) of this section.

(2) Special ladders and platforms. Portable ladders and platforms used on structures or conductors in conjunction with overhead line work need not meet chapter 296-24 WAC, Part J-1 or chapter 296-155 WAC, Part J. However, these ladders and platforms shall meet the following requirements:

(a) Ladders and platforms shall be secured to prevent their becoming accidentally dislodged.

(b) Ladders and platforms may not be loaded in excess of the working loads for which they are designed.

(c) Ladders and platforms may be used only in applications for which they were designed.

(d) In the configurations in which they are used, ladders and platforms shall be capable of supporting without failure at least 2.5 times the maximum intended load.

(e) All ladders shall be handled and stored in such a manner as to prevent damage to the ladder.

(f) When ascending or descending a ladder, the employee shall face the ladder and have free use of both hands.

(g) All defective ladders shall be taken out of service and labeled as defective.

(h) When a ladder is being used which is not fixed or otherwise secured, there shall be an attendant to hold the ladder and watch traffic when the work is being done on streets, alleys, sidewalks, or in industrial plants or other places where there exists the possibility of accidental contact with the ladder by third persons or vehicles.

(i) When working on the ladder, employees shall, where possible, tie the top of the ladder to a substantial object to prevent falling unless the ladder is equipped with approved hooks which may be used for the same purpose.

(j) Portable ladders shall not be moved with employees on the ladder.

(k) No employee shall ascend or descend a rolling ladder while it is moving.

(l) No employee shall stand on the top two steps of a step ladder.

(m) No employee shall use a step ladder as a straight ladder.

(n) Ladders shall always be placed on a secure footing with both legs resting firmly on the lower surface.

(o) Ladders made by fastening cleats or similar devices across a single rail shall not be used.

(3) Conductive ladders. Portable metal ladders and other portable conductive ladders may not be used near exposed energized lines or equipment. However, in specialized high-voltage work, conductive ladders shall be used where the employer can demonstrate that nonconductive ladders would present a greater hazard than conductive ladders.

Note: A greater electrical hazard would be static electricity such as might be found in extra high voltage substations.

(4) All conductive or metal ladders shall be prominently marked and identified as being conductive and shall be grounded when used near energized lines or equipment.

Note: See chapter 296-24 WAC for additional ladder requirements.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-275, filed 3/6/98, effective 5/6/98.]

WAC 296-45-285 Hand, and portable powered tools.

(1) General requirements.

(a) The employer shall assure that each hand and portable powered tool, including any tool provided by an employee, is maintained in serviceable condition.

(b) The employer shall assure that each tool, including any tool provided by an employee, is inspected before initial use during each workshift. At a minimum, the inspection shall include the following:

(i) Handles and guards, to assure that they are sound, tight-fitting, properly shaped, free of splinters and sharp edges, and in place;

(ii) Controls, to assure proper function;

(iii) Heads of shock, impact-driven and driving tools, to assure that there is no mushrooming;

(iv) Cutting edges, to assure that they are sharp and properly shaped; and

(v) All other safety devices, to assure that they are in place and function properly.

(c) The employer shall assure that each tool is used only for purposes for which it has been designed.

(d) When the head of any shock, impact-driven or driving tool begins to chip, it shall be repaired or removed from service.

(e) The cutting edge of each tool shall be sharpened in accordance with manufacturer's specifications whenever it becomes dull during the workshift.

(f) Each tool shall be stored in the provided location when not being used at a work site.

(g) Racks, boxes, holsters or other means shall be provided, arranged and used for the transportation of tools so that a hazard is not created for any vehicle operator or passenger.

(2) Electric equipment connected by cord and plug must meet the following requirements:

(a) Cord- and plug-connected equipment supplied by premises wiring is covered by chapter 296-24 WAC, Part L.

(b) Any cord- and plug-connected equipment supplied by other than premises wiring shall comply with one of the following instead of chapter 296-24 WAC, Part L:

(i) It shall be equipped with a cord containing an equipment grounding conductor connected to the tool frame and to a means for grounding the other end (however, this option may not be used where the introduction of the ground into the work environment increases the hazard to an employee); or

(ii) It shall be of the double-insulated type conforming to 296-24 WAC, Part L; or

(iii) It shall be connected to the power supply through an isolating transformer with an ungrounded secondary.

(3) Portable and vehicle-mounted generators. Portable and vehicle-mounted generators used to supply cord- and plug-connected equipment shall meet the following requirements:

(a) The generator may only supply equipment located on the generator or the vehicle and cord- and plug-connected equipment through receptacles mounted on the generator or the vehicle.

(b) The non-current-carrying metal parts of equipment and the equipment grounding conductor terminals of the receptacles shall be bonded to the generator frame.

(c) In the case of vehicle-mounted generators, the frame of the generator shall be bonded to the vehicle frame.

(d) Any neutral conductor shall be bonded to the generator frame.

(4) Hydraulic and pneumatic tools must meet the following requirements:

(a) Safe operating pressures for hydraulic and pneumatic tools, hoses, valves, pipes, filters, and fittings may not be exceeded.

Note: If any hazardous defects are present, no operating pressure would be safe, and the hydraulic or pneumatic equipment involved may not be used. In the absence of defects, the maximum rated operating pressure is the maximum safe pressure.

(b) A hydraulic or pneumatic tool used where it may contact exposed live parts shall (use nonconductive hoses and) be designed and maintained for such use.

(c) The hydraulic system supplying a hydraulic tool used where it may contact exposed live parts shall provide protection against loss of insulating value for the voltage involved due to the formation of a partial vacuum in the hydraulic line.

Note: Hydraulic lines without check valves having a separation of more than 35 feet (10.7 m) between the oil reservoir and the upper end of the hydraulic system promote the formation of a partial vacuum.

(d) A pneumatic tool used on energized electric lines or equipment or used where it may contact exposed live parts shall provide protection against the accumulation of moisture in the air supply.

(e) Pressure shall be released before connections are broken, unless quick acting, self-closing connectors are used. Hoses may not be kinked.

(f) Employees may not use any part of their bodies to locate or attempt to stop a hydraulic leak.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-285, filed 3/6/98, effective 5/6/98.]

WAC 296-45-295 Gasoline engine power chain saws.

(1) Each chain saw placed into initial service after February 9, 1995, shall be equipped with a chain brake and shall otherwise meet the requirements of the ANSI B175.1-1991 "Safety Requirements for Gasoline-Powered Chain Saws." Each chain saw placed into service before February 9, 1995, shall be equipped with a protective device that minimizes chain saw kickback, i.e., reduced kickback bar, chains, bar tip guard or chain brake. No chain-saw kickback device shall be removed or otherwise disabled.

(2) Gasoline-engine power saw operations shall meet the requirements of WAC 296-54-515(10).

(3) The chain saw shall be operated and adjusted in accordance with the manufacturer's instructions.

(4) The employer must ensure that each chain saw, including any chain saw provided by an employee, is inspected before initial use during each workshift. At a minimum, the inspection shall include the following:

(a) Chain-saw chains, to assure proper adjustment;

(b) Chain-saw mufflers, to assure that they are operational and in place;

(c) Chain brakes and nose shielding devices, to assure that they are in place and function properly;

(5) The chain saw shall be fueled at least 10 feet (3 m) from any open flame or other source of ignition.

(6) The chain saw shall be started at least 10 feet (3 m) from the fueling area.

(7) The chain saw shall be started on the ground or where otherwise firmly supported. Drop-starting a chain saw is prohibited.

(8) The chain saw shall be started with the chain brake engaged.

(9) The chain saw shall be held with the thumbs and fingers of both hands encircling the handles during operation unless the employer demonstrates that a greater hazard is posed by keeping both hands on the chain saw in that particular situation.

(10) The chain-saw operator shall be certain of footing before starting to cut. The chain saw shall not be used in a position or at a distance that could cause the operator to become off-balance, to have insecure footing, or to relinquish a firm grip on the saw.

(11) Prior to felling any tree, the chain saw operator shall clear away brush or other potential obstacles which might interfere with cutting the tree or using the retreat path.

(12) The chain saw shall not be used to cut directly overhead.

(13) The chain saw shall be carried in a manner that will prevent operator contact with the cutting chain and muffler.

(14) The chain saw shall be shut off or at idle before the feller starts their retreat.

(15) The chain saw shall be shut down or the chain brake shall be engaged whenever a saw is carried further than 50 feet (15.2 m). The chain saw shall be shut down or the chain brake shall be engaged when a saw is carried less than 50 feet if conditions such as, but not limited to, the terrain, underbrush and slippery surfaces, may create a hazard for an employee.

(16) Each power saw weighing more than 15 pounds (6.8 kilograms, service weight) that is used in trees shall be sup-

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ported by a separate line, except when work is performed from an aerial lift and except during topping or removing operations where no supporting limb will be available, and the following:

(a) Each power saw shall be equipped with a control that will return the saw to idling speed when released;

(b) Each power saw shall be equipped with a clutch and shall be so adjusted that the clutch will not engage the chain drive at idling speed;

(c) Drop starting of saws over 15 pounds (6.8 kg) is permitted outside of the bucket of an aerial lift only if the area below the lift is clear of personnel;

(d) A power saw engine may be started and operated only when all employees other than the operator are clear of the saw;

(e) A power saw may not be running when the saw is being carried up into a tree by an employee; and

(f) Power saw engines shall be stopped for all cleaning, refueling, adjustments, and repairs to the saw or motor, except as the manufacturer's servicing procedures require otherwise.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-295, filed 3/6/98, effective 5/6/98.]

WAC 296-45-305 Live-line tools. (1) Design of tools.

Live-line tool rods, tubes, and poles shall be designed and constructed to withstand the following minimum tests:

(a) 100,000 volts per foot (3281 volts per centimeter) of length for 5 minutes if the tool is made of fiberglass-reinforced plastic (FRP); or

(b) 75,000 volts per foot (2461 volts per centimeter) of length for 3 minutes if the tool is made of wood; or

(c) Other tests that the employer can demonstrate are equivalent.

Note: Live-line tools using rod and tube that meet ASTM F711-89, Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live-Line Tools, conform to subsection (1)(a) of this section.

(2) Condition of tools.

(a) Each live-line tool shall be wiped clean and visually inspected for defects before use each day.

(b) If any defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is present after wiping, the tool shall be removed from service and examined and tested according to this section before being returned to service.

(c) Live-line tools used for primary employee protection shall be removed from service every two years and whenever required under this subsection for examination, cleaning, repair, and testing as follows:

(i) Each tool shall be thoroughly examined for defects.

(ii) If a defect or contamination that could adversely affect the insulating qualities or mechanical integrity of the live-line tool is found, the tool shall be repaired and refinished or shall be permanently removed from service. If no such defect or contamination is found, the tool shall be cleaned and waxed.

(iii) The tool shall be tested in accordance with this section under the following conditions:

(A) After the tool has been repaired or refinished; and

(B) After the examination if repair or refinishing is not performed, unless the tool is made of FRP rod or foam-filled FRP tube and the employer can demonstrate that the tool has no defects that could cause it to fail in use.

(iv) The test method used shall be designed to verify the tool's integrity along its entire working length and, if the tool is made of fiberglass-reinforced plastic, its integrity under wet conditions.

(v) The voltage applied during the tests shall be as follows:

(A) 75,000 volts per foot (2461 volts per centimeter) of length for one minute if the tool is made of fiberglass; or

(B) 50,000 volts per foot (1640 volts per centimeter) of length for one minute if the tool is made of wood; or

(C) Other tests that the employer can demonstrate are equivalent.

Note: Guidelines for the examination, cleaning, repairing, and in-service testing of live-line tools are contained in the Institute of Electrical and Electronics Engineers Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools, IEEE Std. 978-1984.

(d) Live-line tools and rope shall be stored and maintained and used in such a manner as to prevent damage. Live-line tools and ropes shall not be used for purposes other than line work.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-305, filed 3/6/98, effective 5/6/98.]

WAC 296-45-315 Materials handling and storage. (1)

General. Material handling and storage shall conform to the requirements of chapter 296-24 WAC, Part D.

(2) Materials storage near energized lines or equipment. In areas not restricted to qualified persons only, materials or equipment may not be stored closer to energized lines or exposed energized parts of equipment than the following distances plus an amount providing for the maximum sag and side swing of all conductors and providing for the height and movement of material handling equipment:

(a) For lines and equipment energized at 50 kV or less, the distance is 10 feet (305 cm).

(b) For lines and equipment energized at more than 50 kV, the distance is 10 feet (305 cm) plus 4 inches (10 cm) for every 10 kV over 50 kV.

(c) In areas restricted to qualified employees, material may not be stored within the working space about energized lines or equipment.

Note: Requirements for the size of the working space are contained in WAC 296-45-475(1) and 296-45-48515.

(3) Prior to unloading steel, poles, crossarms and similar materials, the load shall be thoroughly examined to determine if the load has shifted, binders or stakes have broken or the load is otherwise hazardous to employees. The hoist rope shall not be wrapped around the load. This provision shall not apply to electric construction crews when setting or removing poles.

(4) Pole handling.

(a) During pole hauling operations, all loads shall be secured to prevent displacement, and a red flag shall be displayed at the trailing end of the longest pole.

(b) While loading and unloading materials, roadways shall not be blocked unless approved traffic control is used.

(c) When hauling poles during darkness, illuminated warning devices shall be attached to the trailing end of the longest pole in accordance with the state of Washington motor vehicle code.

(5) Tag lines. When necessary to control loads, tag lines or other approved devices shall be used.

(6) Oil filled equipment. During construction or repair of oil filled equipment, the oil may be stored in temporary containers other than those required by WAC 296-155-270, such as pillow tanks.

(7) Storage of tools and materials. All tools and materials shall be stored in a safe and orderly manner in yards for equipment and other areas.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-315, filed 3/6/98, effective 5/6/98.]

WAC 296-45-325 Working on or near exposed energized parts. This section applies to work on exposed live parts, or near enough to them, to expose the employee to any hazard they present.

(1) General. Only qualified employees may work on or with exposed energized lines or parts of equipment. Only qualified employees may work in areas containing unguarded, uninsulated energized lines or parts of equipment operating at 50 volts or more. Electric lines and equipment shall be considered and treated as energized unless the provisions of WAC 296-45-175 through 296-45-17565 or 296-45-335 have been followed.

(2) Except as provided in subsection (3) of this section, at least two qualified employees shall be present while the following types of work are being performed:

(a) Installation, removal, or repair of lines that are energized at more than 600 volts;

(b) Installation, removal, or repair of de-energized lines if an employee is exposed to contact with other parts energized at more than 600 volts;

(c) Installation, removal, or repair of equipment, such as transformers, capacitors, and regulators, if an employee is exposed to contact with parts energized at more than 600 volts;

(d) Work involving the use of mechanical equipment, other than insulated aerial lifts, near parts energized at more than 600 volts; and

(e) Other work that exposes an employee to electrical hazards greater than or equal to those posed by operations that are specifically listed in subsection (2)(a) through (e) of this section.

Note 1: One employee shall serve principally as a standby person who shall be so located that they may physically reach the other employee in the event of an accident either with their hand or with a hot stick. The stand-by shall be so positioned as to be able to observe the other employee, their bodily movements, and verbally warn of any impending dangers. In no case when working in pairs shall employees work simultaneously on energized wires or parts of different phases or polarity;

Note 2: In cases of necessity the stand-by person may temporarily assist the other employee provided that they both work on wires or parts of the same phase or polarity. Both employees shall so position themselves so that the presence of the second person does not increase the hazard.

(3) The provisions of WAC 296-45-325(2) do not apply in the following circumstances:

- (a) When re-fusing circuits or equipment with a hot stick.
- (b) When operating switches by means of operating handle or switch sticks.
- (c) When installing or removing a hot line clamp connection with an approved hot stick on single phase line or apparatus, providing that the connection or disconnection does not interrupt or pick up a load.
- (d) When installing or removing by hot stick simple load metering devices provided the connection does not interrupt or pickup load.
- (e) Emergency repairs to the extent necessary to safeguard the general public.

(4) "Minimum approach distances." The employer shall ensure that no employee approaches or takes any conductive object closer to exposed energized parts than set forth in Table 1 through Table 4, unless:

The employee is insulated from the energized part (insulating gloves or insulating gloves and sleeves worn in accordance with subsection (7) of this section are considered insulation of the employee only with regard to the energized part upon which work is being performed); or

The energized part is insulated from the employee and from any other conductive object at a different potential.

Note 1: WAC 296-45-475 (5)(a) and 296-45-48525(1) contain requirements for the guarding and isolation of live parts. Parts of electric circuits that meet these two provisions are not considered as "exposed" unless a guard is removed or an employee enters the space intended to provide isolation from the live parts.

Note 2: When an employee is required to work on or within reach of any unprotected conductors that are or may become energized at more than 50 volts and less than 600 volts between phases, they shall take the following precautions:

- 1: They shall wear approved insulating gloves or insulating gloves and sleeves during the time they are working on such conductor, or
- 2: They shall cover, with approved devices, any adjacent unprotected conductor that could be touched by any part of their body, and use insulated tools.
- 3: Cables which are properly insulated for the voltages to which they are energized, shall be considered as an effective barrier to protect the employees and Table 1 need not apply.

(5) Initial determination.

(a) Before any work is performed, the location of energized lines and their condition, the location and condition of energized equipment, the condition of the poles, the location of circuits and equipment including power communication lines, CATV and fire alarm circuits, shall be determined as shall any other particular hazard of a particular work site.

(b) No work shall be performed on energized lines or parts until the voltage of such equipment and lines is determined.

(6) Type of insulation. If the employee is to be insulated from energized parts by the use of insulating gloves (under subsection (4)(a) of this section), insulating sleeves shall also be used. However, insulating sleeves need not be used under the following conditions:

- (a) If exposed energized parts on which work is not being performed are insulated from the employee; and
- (b) If such insulation is placed from a position not exposing the employee's upper arm to contact with other energized parts.

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(7) Working position. The employer shall ensure that each employee, to the extent that other safety-related conditions at the worksite permit, works in a position from which a slip or shock will not bring the employee's body into contact with exposed, uninsulated parts energized at a potential different from the employee.

(8) Making connections. The employer shall ensure that connections are made as follows:

- (a) In connecting de-energized equipment or lines to an energized circuit by means of a conducting wire or device, an employee shall first attach the wire to the de-energized part;
- (b) When disconnecting equipment or lines from an energized circuit by means of a conducting wire or device, an employee shall remove the source end first; and
- (c) When lines or equipment are connected to or disconnected from energized circuits, loose conductors shall be kept away from exposed energized parts.

(9) Rubber gloves can only be used on 5,000 volts or less between phases.

(10) It shall not be permissible to consider one part of a high voltage switch or disconnect as de-energized for the purpose of doing work on it if the remainder of the switch or disconnect remains energized unless approved barriers are erected which will prevent employees who are doing the work on such equipment from coming in direct contact with the energized parts.

(11) Conductor support tools such as link sticks, strain carriers, and insulator cradles may be used: Provided, That the clear insulation is at least as long as the insulator string or the minimum distance specified in Table 1 for the operating voltage.

(12) Apparel.

(a) When work is performed within reaching distance of exposed energized parts of equipment, the employer shall ensure that each employee removes or renders nonconductive all exposed conductive articles, such as key or watch chains, rings, or wrist watches or bands, unless such articles do not increase the hazards associated with contact with the energized parts.

(b) The employer shall train each employee who is exposed to the hazards of flames or electric arcs in the hazards involved.

(c) The employer shall ensure that each employee who is exposed to the hazards of flames or electric arcs does not wear clothing that, when exposed to flames or electric arcs, could increase the extent of injury that would be sustained by the employee.

Note: Clothing made from the following types of fabrics, either alone or in blends, is prohibited by this subsection, unless the employer can demonstrate that the fabric has been treated to withstand the conditions that may be encountered or that the clothing is worn in such a manner as to eliminate the hazard involved: Acetate, nylon, polyester, rayon.

(d) Workers shall wear clothing appropriate to the season and the kind of work being performed. Shirts or jumpers must have full length sleeves that are rolled down. Protective hard hats and eye protection shall be worn when working on or near live parts or while climbing poles.

(13) Fuse handling. When fuses must be installed or removed with one or both terminals energized at more than

300 volts or with exposed parts energized at more than 50 volts, the employer shall ensure that tools or gloves rated for the voltage are used. When expulsion-type fuses are installed with one or both terminals energized at more than 300 volts, the employer shall ensure that each employee wears eye protection meeting the requirements of WAC 296-45-25505(1), uses a tool rated for the voltage, and is clear of the exhaust path of the fuse barrel.

(14) Covered (noninsulated) conductors. The requirements of this section which pertain to the hazards of exposed live parts also apply when work is performed in the proximity of covered (noninsulated) wires.

(15) Noncurrent-carrying metal parts. Noncurrent-carrying metal parts of equipment or devices, such as transformer cases and circuit breaker housings, shall be treated as energized at the highest voltage to which they are exposed, unless the employer inspects the installation and determines that these parts are grounded before work is performed.

(16) Opening circuits under load. Devices used to open circuits under load conditions shall be designed to interrupt the current involved.

Table 1: AC Live Work Minimum Approach Distance
Distance to employee

Voltage in kilovolts phase to phase*	Phase to ground		Phase to Phase	
	(m)	(ft-in)	(m)	(ft-in)
0 to 0.050	not specified		not specified	
0.051 to 0.300	avoid contact			
0.301 to 0.750	0.31	1-0	0.31	1-0
0.751 to 15	0.65	2-2	0.67	2-3
15.1 to 36.0	0.77	2-7	0.86	2-10
36.1 to 46.0	0.84	2-9	0.96	3-2
46.1 to 72.5	1.00**	3-3**	1.20	3-11
72.6 to 121	0.95**	3-2**	1.29	4-3
138 to 145	1.09	3-7	1.50	4-11
161 to 169	1.22	4-0	1.71	5-8
230 to 242	1.59	5-3	2.27	7-6
345 to 362	2.59	8-6	3.80	12-6
500 to 550	3.42	11-3	5.50	18-1
765 to 800	4.53	14-11	7.91	26-0

*For single-phase systems, use the highest voltage available. For single-phase lines off three phase systems, use the phase-to-phase voltage of the system.

**The 46.1 to 72.5 kV phase-to-ground 3-3 distance contains a 1-3 electrical component and a 2-0 inadvertent movement component while the 72.6 to 121 kV phase-to-ground 3-2 distance contains a 2-2 electrical component and a 1-0 inadvertent movement component.

Note 1: These distances take into consideration the highest switching surge an employee will be exposed to on any system with air as the insulating medium and the maximum voltages shown.

Note 2: The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.

Note 3: See Appendix B to this section for information on how the minimum approach distances listed in the tables were derived.

[Statutory Authority: RCW 49.17.040. 99-09-080, § 296-45-325, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-325, filed 3/6/98, effective 5/6/98.]

WAC 296-45-335 De-energizing lines and equipment for employee protection. (1) Application. This section applies to the de-energizing of transmission and distribution lines and equipment for the purpose of protecting employees. Control of hazardous energy sources used in the generation of electric energy is covered in WAC 296-45-175. Conductors and parts of electric equipment that have been de-ener-

gized under procedures other than those required by WAC 296-45-175 or 296-45-335, as applicable, shall be treated as energized.

(2) "General."

(a) If a system operator is in charge of the lines or equipment and their means of disconnection, all of the requirements of subsection (3) of this section shall be observed, in the order given.

(b) If no system operator is in charge of the lines or equipment and their means of disconnection, one employee in the crew shall be designated as being in charge of the clearance. All of the requirements of subsection (3) of this section apply, in the order given, except as provided in subsection (2)(c) of this section. The employee in charge of the clearance shall take the place of the system operator, as necessary.

(c) If only one crew will be working on the lines or equipment and if the means of disconnection is accessible and visible to and under the sole control of the employee in charge of the clearance, subsection (3)(a), (c), and (d) of this section do not apply. Additionally, tags required by the remaining provisions of subsection (3) of this section need not be used.

(d) Any disconnecting means that are accessible to persons outside the employer's control (for example, the general public) shall be rendered inoperable while they are open for the purpose of protecting employees.

(3) De-energizing lines and equipment.

(a) In all cases, switching orders must be given directly to the employees in charge of operating the switches by the system operator who has jurisdiction and such communications must be repeated back word for word to the speaker. When requesting clearance on lines under the control of the system operator, a person requesting the clearance shall obtain the name of the system operator to whom the request was made and the system operator shall obtain the name of the person requesting the clearance; and assure that the person is qualified to receive such a clearance. A designated employee shall make a request of the system operator to have the particular section of line or equipment de-energized. The designated employee becomes the employee in charge (as this term is used in subsection (2)(b) of this section) and is responsible for the clearance. In giving a clearance, the system operator shall make certain that the person to whom the clearance is given is fully aware of the extent or the limits of the clearance.

(b) All switches, disconnectors, jumpers, taps, and other means through which known sources of electric energy may be supplied to the particular lines and equipment to be de-energized shall be opened. Such means shall be rendered inoperable, unless its design does not so permit, and tagged to indicate that employees are at work.

(c) Automatically and remotely controlled switches that could cause the opened disconnecting means to close shall also be tagged at the point of control. The automatic or remote control feature shall be rendered inoperable, unless its design does not so permit.

(d) Tags shall prohibit operation of the disconnecting means and shall indicate that employees are at work.

(e) After the applicable requirements in subsection (3)(a) through (d) of this section have been followed and the

employee in charge of the work has been given a clearance by the system operator, the lines and equipment to be worked shall be tested to ensure that they are de-energized.

(4) The system operator shall order clearance tags printed on red cardboard, or equivalent, not less than 2-1/4 inches by 4-1/2 inches, attached to all switches opened or checked open to provide clearance on any line or equipment for employees to work thereon.

(5) Clearance tags attached to substation control devices and to line switches beyond the switchyard of any substation; indicating the limits of the clearance involved; shall state the designation of the switch opened or checked open and tagged; the name of the person to whom the clearance is to be issued; the date and time the switch was opened or checked open; the name of the dispatcher ordering the switching and tagging; and the name of the person doing the switching and tagging.

(6) Protective grounds shall be installed as required by WAC 296-45-345.

(7) After the applicable requirements of subsection (3)(a) through (d) of this section have been followed, the lines and equipment involved may be worked as de-energized.

(8) If two or more independent crews will be working on the same lines or equipment, each crew shall independently comply with the requirements in subsection (3) of this section.

(9) To transfer the clearance, the employee in charge (or, if the employee in charge is forced to leave the worksite due to illness or other emergency, the employee's supervisor) shall inform the system operator; employees in the crew shall be informed of the transfer; and the new employee in charge shall be responsible for the clearance.

(10) To release a clearance, the employee in charge shall:

(a) Notify employees under his or her direction that the clearance is to be released;

(b) Determine that all employees in the crew are clear of the lines and equipment;

(c) Determine that all protective grounds installed by the crew have been removed; and

(d) Report this information to the system operator and release the clearance.

(11) The person releasing a clearance shall be the same person that requested the clearance, unless responsibility has been transferred under subsection (9) of this section.

(12) Tags may not be removed unless the associated clearance has been released under subsection (10) of this section.

(13) Only after all protective grounds have been removed, after all crews working on the lines or equipment have released their clearances, after all employees are clear of the lines and equipment, and after all protective tags have been removed from a given point of disconnection, may action be initiated to reenergize the lines or equipment at that point of disconnection.

(14) To meet unforeseen conditions, it will be permissible to tag isolated switches for the system operator and issue clearances against this tag. In tagging out inter-utility tie lines, the open switches on the foreign end of the line shall be tagged for the foreign system operator requesting the outage

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who will issue clearances to individuals of the organization against this tag.

(15) Metal-clad, draw-out switchgear of over 600 volts in which the physical separation of the disconnecting parts is not visible may be used to clear a line or equipment, provided the switchgear is equipped with:

(a) A positive positioning means to insure that the disconnecting contacts are separated;

(b) An isolating shutter which moves into place between the separated contact for circuit isolation; and

(c) A mechanically-connected indicating means to show that the shutter is in place.

(16) In all other cases, only a visible break of all phases shall be regarded as clearing a line or equipment.

(17) No person shall make contact with a circuit or equipment that has not been taken out of service to be worked on until he/she has the circuit or equipment cleared and tagged for themselves or is working directly under the supervision of one who has the circuit or equipment cleared and tagged for themselves.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-335, filed 3/6/98, effective 5/6/98.]

WAC 296-45-345 Grounding for the protection of employees. (1) Application. This section applies to the grounding of transmission and distribution lines and equipment for the purpose of protecting employees. Subsection (4) of this section also applies to the protective grounding of other equipment as required elsewhere in this section.

(2) General. For the employee to work lines or equipment as de-energized, the lines or equipment shall be de-energized under the provisions of WAC 296-45-335 and shall be grounded as specified in subsections (3) through (9) of this section. However, if the employer can demonstrate that installation of a ground is impracticable or that the conditions resulting from the installation of a ground would present greater hazards than working without grounds, the lines and equipment may be treated as de-energized provided all of the following conditions are met:

(a) The lines and equipment have been de-energized under the provisions of WAC 296-45-335.

(b) There is no possibility of contact with another energized source.

(c) The hazard of induced voltage is not present.

(3) Equipotential zone. Temporary protective grounds shall be placed at such locations and arranged in such a manner as to prevent each employee from being exposed to hazardous differences in electrical potential.

(4) Protective grounding equipment.

(a) Protective grounding equipment shall be capable of conducting the maximum fault current that could flow at the point of grounding for the time necessary to clear the fault. This equipment shall have an ampacity greater than or equal to that of No. 2 AWG copper.

(b) Grounding jumpers shall have approved ferrules and grounding clamps that provide mechanical support for jumper cables independent of the electrical connection.

Note: Guidelines for protective grounding equipment are contained in American Society for Testing and Materials Standard Specifications for Temporary Grounding Systems to

be Used on De-Energized Electric Power Lines and Equipment, ASTM F855-1990.

(c) Protective grounds shall have an impedance low enough to cause immediate operation of protective devices in case of accidental energizing of the lines or equipment.

(5) Testing. Before any ground is installed, lines and equipment shall be tested and found absent of nominal voltage, unless a previously installed ground is present.

(a) Inspection before use: Grounding equipment shall be given a visual inspection and all mechanical connections shall be checked for tightness before each use.

(b) Ground surface cleaning: The surface to which the ground is to be attached shall be clean before the grounding clamp is installed; otherwise, a self-cleaning clamp shall be used.

(6) Order of connection. When a ground is to be attached to a line or to equipment, the ground-end connection shall be attached first, and then the other end shall be attached by means of a live-line tool.

(7) "Order of removal." When a ground is to be removed, the grounding device shall be removed from the line or equipment using a live-line tool before the ground-end connection is removed.

(8) "Additional precautions." When work is performed on a cable at a location remote from the cable terminal, the cable may not be grounded at the cable terminal if there is a possibility of hazardous transfer of potential should a fault occur.

(9) Removal of grounds for test. Grounds may be removed temporarily during tests. During the test procedure, the employer shall ensure that each employee uses insulating equipment and is isolated from any hazards involved, and the employer shall institute any additional measures as may be necessary to protect each exposed employee in case the previously grounded lines and equipment become energized.

(10) Conductor separation: In cases where the conductor separation at any pole or structure is so great as to make it impractical to apply shorts on all conductors, and where only one conductor is to be worked on, only that conductor which is to be worked on needs to be grounded.

(11) Ground personnel: In cases where ground rods or pole grounds are utilized for personal protective grounding, personnel working on the ground should maintain sufficient distance from such equipment or utilize other approved procedures designed to prevent "touch-and step potential" hazards.

Note: See the Appendix for tables.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-345, filed 3/6/98, effective 5/6/98.]

WAC 296-45-355 Underground grounding. (1)

Grounding. A capacitance charge can remain in the high voltage cables after it has been disconnected from the circuit and a static-type arc can occur when grounds are applied to such cables.

(2) When work is to be done on cables or equipment of a high-voltage underground system, precautions to prevent back-feed shall be taken. This shall include either isolating or grounding of the secondary conductors.

(3) After grounding the cable, if the worker is to work on cable between terminations, he/she must first spike the cable or use other approved methods of testing. If the cable is to be cut, it shall be cut only with approved hot cutters.

(4) Additional precautions. When work is performed on a cable at a location remote from the cable terminal, the cable may not be grounded at the cable terminal if there is a possibility of hazardous transfer of potential should a fault occur.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-355, filed 3/6/98, effective 5/6/98.]

WAC 296-45-365 Testing and test facilities. (1)

Application. This section provides for safe work practices for high-voltage and high-power testing performed in laboratories, shops, and substations, and in the field and on electric transmission and distribution lines and equipment. It applies only to testing involving interim measurements utilizing high voltage, high power, or combinations of both, and not to testing involving continuous measurements as in routine metering, relaying, and normal line work.

Note: Routine inspection and maintenance measurements made by qualified employees are considered to be routine line work and are not included in the scope of this section, as long as the hazards related to the use of intrinsic high-voltage or high-power sources require only the normal precautions associated with routine operation and maintenance work required in the other subsections of this section. Two typical examples of such excluded test work procedures are "phasing-out" testing and testing for a "no-voltage" condition.

(2) General requirements.

(a) The employer shall establish and enforce work practices for the protection of each worker from the hazards of high-voltage or high-power testing at all test areas, temporary and permanent. Such work practices shall include, as a minimum, test area guarding, grounding, and the safe use of measuring and control circuits. A means providing for periodic safety checks of field test areas shall also be included.

(b) Employees shall be trained in safe work practices upon their initial assignment to the test area, with periodic reviews and updates provided as required by subsections of this section.

(3) Guarding of test areas.

(a) Permanent test areas shall be guarded by walls, fences, or barriers designed to keep employees out of the test areas.

(b) In field testing, or at a temporary test site where permanent fences and gates are not provided, one of the following means shall be used to prevent unauthorized employees from entering:

(i) The test area shall be guarded by the use of distinctively colored safety tape that is supported approximately waist high and to which safety signs are attached;

(ii) The test area shall be guarded by a barrier or barricade that limits access to the test area to a degree equivalent, physically and visually, to the barricade specified in this section; or

(iii) The test area shall be guarded by one or more test observers stationed so that the entire area can be monitored.

(c) The barriers required by this section shall be removed when the protection they provide is no longer needed.

(d) Guarding shall be provided within test areas to control access to test equipment or to apparatus under test that may become energized as part of the testing by either direct or inductive coupling, in order to prevent accidental employee contact with energized parts.

(4) Grounding practices.

(a) The employer shall establish and implement safe grounding practices for the test facility.

(i) All conductive parts accessible to the test operator during the time the equipment is operating at high voltage shall be maintained at ground potential except for portions of the equipment that are isolated from the test operator by guarding.

(ii) Wherever ungrounded terminals of test equipment or apparatus under test may be present, they shall be treated as energized until determined by tests to be de-energized.

(b) Visible grounds shall be applied, either automatically or manually with properly insulated tools, to the high-voltage circuits after they are de-energized and before work is performed on the circuit or item or apparatus under test. Common ground connections shall be solidly connected to the test equipment and the apparatus under test.

(c) In high-power testing, an isolated ground-return conductor system shall be provided so that no intentional passage of current, with its attendant voltage rise, can occur in the ground grid or in the earth. However, an isolated ground-return conductor need not be provided if the employer can demonstrate that both the following conditions are met:

(i) An isolated ground-return conductor cannot be provided due to the distance of the test site from the electric energy source; and

(ii) Employees are protected from any hazardous step and touch potentials that may develop during the test.

Note: See Appendix B for information on measures that can be taken to protect employees from hazardous step and touch potentials.

(d) In tests in which grounding of test equipment by means of the equipment grounding conductor located in the equipment power cord cannot be used due to increased hazards to test personnel or the prevention of satisfactory measurements, a ground that the employer can demonstrate affords equivalent safety shall be provided, and the safety ground shall be clearly indicated in the test set up.

(e) When the test area is entered after equipment is de-energized, a ground shall be placed on the high-voltage terminal and any other exposed terminals.

(i) High capacitance equipment or apparatus shall be discharged through a resistor rated for the available energy.

(ii) A direct ground shall be applied to the exposed terminals when the stored energy drops to a level at which it is safe to do so.

(f) If a test trailer or test vehicle is used in field testing, its chassis shall be grounded. Protection against hazardous touch potentials with respect to the vehicle, instrument panels, and other conductive parts accessible to employees shall be provided by bonding, insulation, or isolation.

(5) Control and measuring circuits.

(a) Control wiring, meter connections, test leads and cables may not be run from a test area unless they are contained in a grounded metallic sheath and terminated in a

grounded metallic enclosure or unless other precautions are taken that the employer can demonstrate as ensuring equivalent safety.

(b) Meters and other instruments with accessible terminals or parts shall be isolated from test personnel to protect against hazards arising from such terminals and parts becoming energized during testing. If this isolation is provided by locating test equipment in metal compartments with viewing windows, interlocks shall be provided to interrupt the power supply if the compartment cover is opened.

(c) The routing and connections of temporary wiring shall be made secure against damage, accidental interruptions and other hazards. To the maximum extent possible, signal, control, ground, and power cables shall be kept separate.

(d) If employees will be present in the test area during testing, a test observer shall be present. The test observer shall be capable of implementing the immediate de-energizing of test circuits for safety purposes.

(6) Safety check.

(a) Safety practices governing employee work at temporary or field test areas shall provide for a routine check of such test areas for safety at the beginning of each series of tests.

(b) The test operator in charge shall conduct these routine safety checks before each series of tests and shall verify at least the following conditions:

(i) That barriers and guards are in workable condition and are properly placed to isolate hazardous areas;

(ii) That system test status signals, if used, are in operable condition;

(iii) That test power disconnects are clearly marked and readily available in an emergency;

(iv) That ground connections are clearly identifiable;

(v) That personal protective equipment is provided and used;

(vi) That signal, ground, and power cables are properly separated.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-365, filed 3/6/98, effective 5/6/98.]

WAC 296-45-375 Mechanical equipment, including aerial manlift equipment. (1) General requirements.

(a) The critical safety components of mechanical elevating and rotating equipment shall receive a thorough visual inspection and operational test before use on each shift.

Note: Critical safety components of mechanical elevating and rotating equipment are components whose failure would result in a free fall or free rotation of the boom.

(b) No vehicular equipment having an obstructed view to the rear may be operated on off-highway jobsites where any employee is exposed to the hazards created by the moving vehicle, unless:

(i) The vehicle has a reverse signal alarm audible above the surrounding noise level; or

(ii) The vehicle is backed up only when a designated employee signals that it is safe to do so.

(c) The operator of an electric line truck may not leave his or her position at the controls while a load is suspended,

unless the employer can demonstrate that no employee (including the operator) might be endangered.

(d) Rubber-tired, self-propelled scrapers, rubber-tired front-end loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler-type tractors, crawler-type loaders, and motor graders, with or without attachments, shall have rollover protective structures that meet the requirements of chapter 296-155 WAC, Part V.

(2) Outriggers.

(a) Vehicular equipment, if provided with outriggers, shall be operated with the outriggers extended and firmly set as necessary for the stability of the specific configuration of the equipment. Outriggers may not be extended or retracted outside of clear view of the operator unless all employees are outside the range of possible equipment motion.

(b) If the work area or the terrain precludes the use of outriggers, the equipment may be operated only within its maximum load ratings for the particular configuration of the equipment without outriggers.

(3) Applied loads. Mechanical equipment used to lift or move lines or other material shall be used within its maximum load rating and other design limitations for the conditions under which the work is being performed.

(4) Hydraulic fluids. All hydraulic fluids used for the insulated section of derrick trucks, aerial lifts, and hydraulic tools which are used on or around energized lines or equipment shall be of the insulating type.

(5) Mechanical adjustment or repairs shall not be attempted or performed in the field except by a person qualified to perform such work.

(6) Malfunction or needed repairs of manlift equipment shall be reported to the employee responsible for such repairs as soon as is reasonably possible. Use of equipment which is known to be in need of repairs or is malfunctioning is prohibited when such deficiency creates an unsafe operating condition.

(7) When any aerial manlift equipment is parked for operation at the jobsite, the brakes shall be set. Wheel chocks shall be used to prevent accidental movement while parked on an incline.

(8) Employees shall not sit or stand on the basket edge, stand on materials placed in or across the basket, or work from a ladder set inside the basket.

(9) The basket shall not be rested on a fixed object(s) so that the weight of the boom is either totally or partially supported by the basket.

(10) Operations near energized lines or equipment.

(a) Mechanical equipment shall be operated so that the minimum approach distances of Table 1 through Table 4 are maintained from exposed energized lines and equipment. However, the insulated upper portion excluding the basket/bucket of an aerial lift operated by a qualified employee in the lift is exempt from this requirement.

(b) A designated employee other than the equipment operator shall observe the approach distance to exposed lines and equipment and give timely warnings before the minimum approach distance required by subsection (10)(a) of this section is reached, unless the employer can demonstrate that the operator can accurately determine that the minimum approach distance is being maintained.

(c) If, during operation of the mechanical equipment, the equipment could become energized, the operation shall also comply with at least one of the following:

(i) The energized lines exposed to contact shall be covered with insulating protective material that will withstand the type of contact that might be made during the operation.

(ii) The equipment shall be insulated for the voltage involved. The equipment shall be positioned so that its uninsulated portions cannot approach the lines or equipment any closer than the minimum approach distances specified in Table 1 through 4.

(iii) Each employee shall be protected from hazards that might arise from equipment contact with the energized lines. The measures used shall ensure that employees will not be exposed to hazardous differences in potential. Unless the employer can demonstrate that the methods in use protect each employee from the hazards that might arise if the equipment contacts the energized line, the measures used shall include all of the following techniques:

(A) Using the best available ground to minimize the time the lines remain energized;

(B) Bonding equipment together to minimize potential differences;

(C) Providing ground mats to extend areas of equipotential; and

(D) Employing insulating protective equipment or barricades to guard against any remaining hazardous potential differences.

Note: Appendix B contains information on hazardous step and touch potentials and on methods of protecting employees from hazards resulting from such potentials.

(11) While working in aerial equipment, employees shall wear a full body harness and a lanyard attached to the boom or basket, in a secure manner.

(12) No component of aerial devices shall be operated from the ground without permission from the employee in the basket except in case of emergency.

(13) Operating levers or controls shall be kept clear of tools, materials or obstructions.

(14) Employees shall not climb into or out of the basket or platform while it is elevated or change from one basket to another on dual basket equipment, except in case of emergency or when the employees involved agree that this is the safest way to perform the work. This exception shall not be used to circumvent safety rules.

(15) Existing safety rules governing the use of hot line tools, rubber and other protective equipment and safe work practices while performing work from poles or structures shall also apply to work done from aerial manlift equipment.

(16) The basket shall be kept clean and all tools not in use shall be secured or removed.

(17) Approved warning light shall be operating when the boom leaves the cradle. This light shall be visible to approaching traffic when the boom is in position over any traveled area.

(18) All aerial manlift equipment shall have both upper and lower controls (except ladder trucks need not have upper controls). The upper controls shall not be capable of rendering the lower controls inoperative. The lower controls should be located at or near the base of the aerial structure. If the

lower controls are used, the operator shall have a view of the elevated employee(s) or there shall be communication between the operator and the employee in the elevated aerial structure: Provided, That no employee shall be raised, lowered, or moved into or from the elevated position in any aerial manlift equipment unless there is another employee, not in the elevated aerial structure, available at the site to operate the lower controls, except as follows:

(a) Where there is a fixed method permanently attached to or part of the equipment which will permit an employee to descend from the elevated position without lowering the elevated structure; or

(b) Where there is a system which will provide operation from the elevated position in the event of failure or malfunction of the primary system.

Note: This section shall not be interpreted as an exception to any other rule in this chapter.

(19) Controls in aerial manlift equipment shall be protected from accidental operation. Controls of the outriggers shall also be protected from accidental operation. Such protection may be by guarding or equivalent means.

(20) The manufacturer's recommended maximum load limit shall be posted at a conspicuous place near each set of controls and shall be kept in a legible condition.

(21) The manufacturer's operator's instructional manual shall be kept on the vehicle.

(22) Operating instructions, proper sequence and maintenance procedures prescribed by the manufacturer for operation of the equipment shall be followed.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060, 98-07-009, § 296-45-375, filed 3/6/98, effective 5/6/98.]

WAC 296-45-385 Overhead lines. This section provides additional requirements for work performed on or near overhead lines and equipment.

(1) General.

(a) Before elevated structures and adjacent structures, such as poles or towers of the adjacent supporting poles, structures, and conductor supporting hardware, are subjected to such stresses as climbing or the installation or removal of equipment may impose, the employer shall ascertain that the structures are capable of sustaining the additional or unbalanced stresses. If the pole or other structure cannot withstand the loads which will be imposed, it shall be braced or otherwise supported so as to prevent failure.

Note: Appendix C contains test methods that can be used in ascertaining whether a wood pole is capable of sustaining the forces that would be imposed by an employee climbing the pole. This paragraph also requires the employer to ascertain that the pole can sustain all other forces that will be imposed by the work to be performed.

(b) When poles are set, moved, or removed near exposed energized overhead conductors, the pole may not contact the conductors.

(c) When a pole is set, moved, or removed near an exposed energized overhead conductor, the employer shall ensure that each employee wears electrical protective equipment or uses insulated devices when handling the pole and that no employee contacts the pole with uninsulated parts of his or her body.

(d) To protect employees from falling into holes into which poles are to be placed, the holes shall be attended by employees or physically guarded whenever anyone is working nearby.

(2) Installing and removing overhead lines. The following provisions apply to the installation and removal of overhead conductors or cable.

(a) The employer shall use the tension stringing method, barriers, or other equivalent measures to minimize the possibility that conductors and cables being installed or removed will contact energized power lines or equipment.

(b) When conductors are being strung in or removed, they shall be kept under positive control to prevent accidental contact with energized circuit.

(c) The protective measures required by WAC 296-45-375(10)(c) for mechanical equipment shall also be provided for conductors, cables, and pulling and tensioning equipment when the conductor or cable is being installed or removed close enough to energized conductors that any of the following failures could energize the pulling or tensioning equipment or the wire or cable being installed or removed:

(i) Failure of the pulling or tensioning equipment;

(ii) Failure of the wire or cable being pulled; or

(iii) Failure of the previously installed lines or equipment.

(d) If the conductors being installed or removed cross over energized conductors in excess of 600 volts and if the design of the circuit-interrupting devices protecting the lines so permits, the automatic-reclosing feature of these devices shall be made inoperative.

(e) Before lines are installed parallel to existing energized lines, the employer shall make a determination of the approximate voltage to be induced in the new lines, or work shall proceed on the assumption that the induced voltage is hazardous. Unless the employer can demonstrate that the lines being installed are not subject to the induction of a hazardous voltage or unless the lines are treated as energized, the following requirements also apply:

(i) Each bare conductor shall be grounded in increments so that no point along the conductor is more than 2 miles (3.22 km) from a ground.

(ii) The grounds required in subsection (2)(e)(i) of this section shall be left in place until the conductor installation is completed between dead ends.

(iii) The grounds required in subsection (2)(e)(i) of this section shall be removed as the last phase of aerial cleanup.

(iv) If employees are working on bare conductors, grounds shall also be installed at each location where these employees are working, and grounds shall be installed at all open dead-end or catch-off points or the next adjacent structure.

(v) If two bare conductors are to be spliced, the conductors shall be bonded and grounded before being spliced.

(f) Reel handling equipment, including pulling and tensioning devices, shall be in safe operating condition and shall be leveled and aligned.

(g) Load ratings of stringing lines, pulling lines, conductor grips, load-bearing hardware and accessories, rigging, and hoists may not be exceeded.

(3) Pulling lines and accessories shall be inspected prior to each use and replaced or repaired when damaged or when there is a reasonable basis to doubt the dependability of such lines or accessories.

(4) Conductor grips may not be used on wire rope, unless the grip is specifically designed for this application.

(5) Reliable communications, through two-way radios or other equivalent means, shall be maintained between the reel tender and the pulling rig operator.

(6) The pulling rig may only be operated when it is safe to do so.

Note: Examples of unsafe conditions include employees in locations prohibited by subsection (7) of this section, conductor and pulling line hang-ups, and slipping of the conductor grip.

(7) While the conductor or pulling line is being pulled (in motion) with a power-driven device, employees are not permitted directly under overhead operations or on the cross arm, except as necessary to guide the stringing sock or board over or through the stringing sheave.

(8) Live-line bare-hand work is prohibited.

(9) When winches, trucks, or tractors are being used to raise poles, materials, to pull in wires, to pull slack or in any other operation, there shall be an operator at the controls unless the machinery or process is stopped.

(10) Leadworkers shall designate an employee to give signals when required.

(11) Raising poles, towers or fixtures in the close proximity of high voltage conductors shall be done under the supervision of a qualified employee.

(12) Employees shall not crawl over insulator strings but shall use a platform or other approved device to work from when making dead ends or doing other work beyond strings of insulators, at such distance that they cannot reach the work from the pole or fixture. While working on the platform or other device, they shall be secured with safety straps or a rope to prevent falling. The provision of this subsection does not apply to extra high voltage bundle conductors when the use of such equipment may produce additional hazard. Climbing over dead end assemblies is permissible only after they have been completed and pinned in the final position.

(13) Towers and structures. The following requirements apply to work performed on towers or other structures which support overhead lines.

(a) The employer shall ensure that no employee is under a tower or structure while work is in progress, except where the employer can demonstrate that such a working position is necessary to assist employees working above.

(b) Tag lines or other similar devices shall be used to maintain control of tower sections being raised or positioned, unless the employer can demonstrate that the use of such devices would create a greater hazard.

(c) The loadline may not be detached from a member or section until the load is safely secured.

(14) A transmission clipping crew shall have a minimum of two structures clipped in between the crew and the conductor being sagged.

(15) While on patrol at night and operating a motor vehicle on public highways, there shall be two employees, at least one of whom shall be a journey level lineworker or otherwise

qualified employee. If repair to line or equipment is found to be of such nature as to require two lineworkers, work shall not proceed until additional help has been obtained provided that in cases of emergency where delay would increase the danger to life, limb, or substantial property, one employee may clear the hazard without assistance.

(16) Except during emergency restoration procedures, work shall be discontinued when adverse weather conditions would make the work hazardous in spite of the work practices required by this section.

Note: Thunderstorms in the immediate vicinity, high winds, snow storms, and ice storms are examples of adverse weather conditions that are presumed to make this work too hazardous to perform, except under emergency conditions.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-385, filed 3/6/98, effective 5/6/98.]

WAC 296-45-455 Line-clearance tree-trimming operations. This section provides additional requirements for line-clearance tree-trimming operations and for equipment used in these operations.

This section does not apply to qualified employees.

(1) Before an employee climbs, enters, or works around any tree, a determination shall be made of the nominal voltage of electric power lines posing a hazard to employees. However, a determination of the maximum nominal voltage to which an employee will be exposed may be made instead, if all lines are considered as energized at this maximum voltage.

(2) There shall be a second line-clearance tree trimmer within normal (that is, unassisted) voice communication under any of the following conditions:

(a) If a line-clearance tree trimmer is to approach more closely than 10 feet (305 cm) any conductor or electrical apparatus energized at more than 600 volts; or

(b) If branches or limbs being removed are closer to lines energized at more than 600 volts than the distances listed in Table 1, Table 4, and Table 5; or

(c) If roping is necessary to remove branches or limbs from such conductors or apparatus.

(3) Line-clearance tree trimmers shall maintain the minimum approach distances from energized conductors given in Table 1, Table 4, and Table 5.

(4) Branches that are contacting exposed energized conductors or equipment or that are within the distances specified in Table 1, Table 4, and Table 5 may be removed only through the use of insulating equipment.

Note: A tool constructed of a material that the employer can demonstrate has insulating qualities meeting WAC 296-45-305(1) are considered as insulated under this section if the tool is clean and dry.

(5) Ladders, platforms, and aerial devices may not be brought closer to an energized part than the distances listed in Table 1, Table 4, and Table 5.

(6) Line-clearance tree-trimming work may not be performed when adverse weather conditions make the work hazardous in spite of the work practices required by this section. Each employee performing line-clearance tree-trimming work in the aftermath of a storm or under similar emergency

conditions shall be trained in the special hazards related to this type of work.

Note: Thunderstorms in the immediate vicinity, high winds, snow storms, and ice storms are examples of adverse weather conditions that are presumed to make line-clearance tree-trimming work too hazardous to perform safely.

(7) A tree trimmer may climb out of a basket into a tree or from a tree back into the basket so long as he is properly tied into the tree during the entire maneuver and the employer can demonstrate that this is the safest way to perform the work.

[Statutory Authority: RCW 49.17.040, 99-09-080, § 296-45-455, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-455, filed 3/6/98, effective 5/6/98.]

WAC 296-45-45505 Brush chippers. (1) Brush chippers shall be equipped with a locking device in the ignition system.

(2) Access panels for maintenance and adjustment of the chipper blades and associated drive train shall be in place and secure during operation of the equipment.

(3) Brush chippers not equipped with a mechanical infeed system shall be equipped with an infeed hopper of length sufficient to prevent employees from contacting the blades or knives of the machine during operation.

(4) Trailer chippers detached from trucks shall be chocked or otherwise secured.

(5) Each employee in the immediate area of an operating chipper feed table shall wear personal protective equipment as required by Subpart I of this Part.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-45505, filed 3/6/98, effective 5/6/98.]

WAC 296-45-45510 Sprayers and related equipment. (1) Walking and working surfaces of sprayers and related equipment shall be covered with slip-resistant material. If slipping hazards cannot be eliminated, slip-resistant footwear or handrails and stair rails meeting the requirements of chapter 296-24 WAC, Part J-1, may be used instead of slip-resistant material.

(2) Equipment on which employees stand to spray while the vehicle is in motion shall be equipped with guardrails around the working area. The guardrail shall be constructed in accordance with chapter 296-24 WAC, Part J-1.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-45510, filed 3/6/98, effective 5/6/98.]

WAC 296-45-45515 Stump cutters. (1) Stump cutters shall be equipped with enclosures or guards to protect employees.

(2) Each employee in the immediate area of stump grinding operations (including the stump cutter operator) shall wear personal protective equipment as required by WAC 296-45-25505.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-45515, filed 3/6/98, effective 5/6/98.]

WAC 296-45-45520 Backpack power units for use in pruning and clearing. (1) While a backpack power unit is

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running, no one other than the operator may be within 10 feet (305 cm) of the cutting head of a brush saw.

(2) A backpack power unit shall be equipped with a quick shutoff switch readily accessible to the operator.

(3) Backpack power unit engines shall be stopped for all cleaning, refueling, adjustments, and repairs to the saw or motor, except as the manufacturer's servicing procedures require otherwise.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-45520, filed 3/6/98, effective 5/6/98.]

WAC 296-45-45525 Rope. (1) Climbing ropes shall be used by employees working aloft in trees. These ropes shall have a minimum diameter of 0.5 inch (1.2 cm) with a minimum breaking strength of 2300 pounds (10.2 kN). Synthetic rope shall have elasticity of not more than 7 percent.

(2) Rope shall be inspected before each use and, if unsafe (for example, because of damage or defect), may not be used.

(3) Rope shall be stored away from cutting edges and sharp tools. Rope contact with corrosive chemicals, gas, and oil shall be avoided.

(4) When stored, rope shall be coiled and piled, or shall be suspended, so that air can circulate through the coils.

(5) Rope ends shall be secured to prevent their unraveling.

(6) Climbing rope may not be spliced to effect repair.

(7) A rope that is wet, that is contaminated to the extent that its insulating capacity is impaired, or that is otherwise not considered to be insulated for the voltage involved may not be used near exposed energized lines.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-45525, filed 3/6/98, effective 5/6/98.]

WAC 296-45-45530 Fall protection. Each employee shall be tied in with a climbing rope and safety saddle when the employee is working above the ground in a tree, unless he or she is ascending into the tree.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-45530, filed 3/6/98, effective 5/6/98.]

WAC 296-45-465 Communication facilities. (1) Microwave transmission. The employer shall ensure that no employee looks into an open waveguide or antenna that is connected to an energized microwave source.

(2) If the electromagnetic radiation level within an accessible area associated with microwave communications systems exceeds the radiation protection guide given in chapter 296-62 WAC, Part J-1. The area shall be posted with the warning symbol described in chapter 296-62 WAC, Part J-1. The lower half of the warning symbol shall include the following statements or ones that the employer can demonstrate are equivalent:

Radiation in this area may exceed hazard limitations and special precautions are required. Obtain specific instruction before entering.

(3) When an employee works in an area where the electromagnetic radiation could exceed the radiation protection guide, the employer shall institute measures that ensure that the employee's exposure is not greater than that permitted by

that guide. Such measures may include administrative and engineering controls and personal protective equipment.

(4) Power line carrier. Power line carrier work, including work on equipment used for coupling carrier current to power line conductors, shall be performed in accordance with the requirements of this section pertaining to work on energized lines.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-465, filed 3/6/98, effective 5/6/98.]

WAC 296-45-475 Substations. This section provides additional requirements for substations and for work performed in them.

(1) Access and working space. Sufficient access and working space shall be provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment.

Note: Guidelines for the dimensions of access and working space about electric equipment in substations are contained in American National Standard-National Electrical Safety Code, ANSI C2-1997. Installations meeting the ANSI provisions comply with WAC 296-45-475(1). An installation that does not conform to this ANSI standard will, nonetheless, be considered as complying with WAC 296-45-475(1) if the employer can demonstrate that the installation provides ready and safe access based on the following evidence:

(a) That the installation conforms to the edition of ANSI C2 that was in effect at the time the installation was made;

(b) That the configuration of the installation enables employees to maintain the minimum approach distances required by WAC 296-45-325(5) while they are working on exposed, energized parts; and

(c) That the precautions taken when work is performed on the installation provide protection equivalent to the protection that would be provided by access and working space meeting ANSI C2-1997.

(2) Draw-out-type circuit breakers. When draw-out-type circuit breakers are removed or inserted, the breaker shall be in the open position. The control circuit shall also be rendered inoperative, if the design of the equipment permits.

(3) Substation fences. Conductive fences around substations shall be grounded. When a substation fence is expanded or a section is removed, fence grounding continuity shall be maintained, and bonding shall be used to prevent electrical discontinuity.

(4) Guarding of rooms containing electric supply equipment.

(a) Rooms and spaces in which electric supply lines or equipment are installed shall meet the requirements of subsection (4)(b) through (e) of this section under the following conditions:

(i) If exposed live parts operating at 50 to 150 volts to ground are located within 8 feet of the ground or other working surface inside the room or space;

(ii) If live parts operating at 151 to 600 volts and located within 8 feet of the ground or other working surface inside the room or space are guarded only by location, as permitted under subsection (5)(a) of this section; or

(iii) If live parts operating at more than 600 volts are located within the room or space, unless:

(A) The live parts are enclosed within grounded, metal-enclosed equipment whose only openings are designed so that foreign objects inserted in these openings will be deflected from energized parts; or

(B) The live parts are installed at a height above ground and any other working surface that provides protection at the voltage to which they are energized corresponding to the protection provided by an 8-foot height at 50 volts.

(b) The rooms and spaces shall be so enclosed within fences, screens, partitions, or walls as to minimize the possibility that unqualified persons will enter.

(c) Signs warning unqualified persons to keep out shall be displayed at entrances to the rooms and spaces.

(d) Entrances to rooms and spaces that are not under the observation of an attendant shall be kept locked.

(e) Unqualified persons may not enter the rooms or spaces while the electric supply lines or equipment are energized.

(5) Guarding of energized parts.

(a) Guards shall be provided around all live parts operating at more than 150 volts to ground without an insulating covering, unless the location of the live parts gives sufficient horizontal or vertical or a combination of these clearances to minimize the possibility of accidental employee contact.

Note: Guidelines for the dimensions of clearance distances about electric equipment in substations are contained in American National Standard-National Electrical Safety Code, ANSI C2-1997. Installations meeting the ANSI provisions comply with subsection (5)(a) of this section. An installation that does not conform to this ANSI standard will, nonetheless, be considered as complying with subsection (5)(a) of this section if the employer can demonstrate that the installation provides sufficient clearance based on the following evidence:

(i) That the installation conforms to the edition of ANSI C2 that was in effect at the time the installation was made;

(ii) That each employee is isolated from energized parts at the point of closest approach; and

(iii) That the precautions taken when work is performed on the installation provide protection equivalent to the protection that would be provided by horizontal and vertical clearances meeting ANSI C2-1997.

(b) Except for fuse replacement and other necessary access by qualified persons, the guarding of energized parts within a compartment shall be maintained during operation and maintenance functions to prevent accidental contact with energized parts and to prevent tools or other equipment from being dropped on energized parts.

(c) When guards are removed from energized equipment, barriers shall be installed around the work area to prevent employees who are not working on the equipment, but who are in the area, from contacting the exposed live parts.

(6) Substation entry.

(a) Upon entering an attended substation, each employee other than those regularly working in the station shall report his or her presence to the employee in charge in order to receive information on special system conditions affecting employee safety.

(b) The job briefing required by WAC 296-45-135 shall cover such additional subjects as the location of energized equipment in or adjacent to the work area and the limits of any de-energized work area.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-475, filed 3/6/98, effective 5/6/98.]

WAC 296-45-485 Power generation. This section provides additional requirements and related work practices for power generating plants.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-485, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48505 Interlocks and other safety devices. (1) Interlocks and other safety devices shall be maintained in a safe, operable condition.

(2) No interlock or other safety device may be modified to defeat its function, except for test, repair, or adjustment of the device.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48505, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48510 Changing brushes. Before exciter or generator brushes are changed while the generator is in service, the exciter or generator field shall be checked to determine whether a ground condition exists. The brushes may not be changed while the generator is energized if a ground condition exists.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48510, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48515 Access and working space. Sufficient access and working space shall be provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment.

Note: Guidelines for the dimensions of access and workspace about electric equipment in generating stations are contained in American National Standard-National Electrical Safety Code, ANSI C2-1997. Installations meeting the ANSI provisions comply with this section. An installation that does not conform to this ANSI standard will, nonetheless, be considered as complying with this section if the employer can demonstrate that the installation provides ready and safe access based on the following evidence:

(1) That the installation conforms to the edition of ANSI C2 that was in effect at the time the installation was made;

(2) That the configuration of the installation enables employees to maintain the minimum approach distances required by this section while they work on exposed, energized parts; and

(3) That the precautions taken when work is performed on the installation provide protection equivalent to the protection that would be provided by access and working space meeting ANSI C2-1997.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48515, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48520 Guarding of rooms containing electric supply equipment. (1) Rooms and spaces in which electric supply lines or equipment are installed shall meet the requirements of this section under the following conditions:

(a) If exposed live parts operating at 50 to 150 volts to ground are located within eight feet of the ground or other working surface inside the room or space;

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(b) If live parts operating at 151 to 600 volts and located within eight feet of the ground or other working surface inside the room or space are guarded only by location, as permitted under this section; or

(c) If live parts operating at more than 600 volts are located within the room or space; unless:

(i) The live parts are enclosed within grounded, metal-enclosed equipment whose only openings are designed so that foreign objects inserted in these openings will be deflected from energized parts; or

(ii) The live parts are installed at a height above ground and any other working surface that provides protection at the voltage to which they are energized corresponding to the protection provided by an eight-foot height at 50 volts.

(2) The rooms and spaces shall be so enclosed within fences, screens, partitions, or walls as to minimize the possibility that unqualified persons will enter.

(3) Signs warning unqualified persons to keep out shall be displayed at entrances to the rooms and spaces.

(4) Entrances to rooms and spaces that are not under the observation of an attendant shall be kept locked.

(5) Unqualified persons may not enter the rooms or spaces while the electric supply lines or equipment are energized.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48520, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48525 Guarding of energized parts. (1) Guards shall be provided around all live parts operating at more than 150 volts to ground without an insulating covering, unless the location of the live parts gives sufficient horizontal or vertical or a combination of these clearances to minimize the possibility of accidental employee contact.

Note: Guidelines for the dimensions of clearance distances about electric equipment in generating stations are contained in American National Standard-National Electrical Safety Code, ANSI C2-1997. Installations meeting the ANSI provisions comply with this section. An installation that does not conform to this ANSI standard will, nonetheless, be considered as complying with this section if the employer can demonstrate that the installation provides sufficient clearance based on the following evidence:

(a) That the installation conforms to the edition of ANSI C2 that was in effect at the time the installation was made;

(b) That each employee is isolated from energized parts at the point of closest approach; and

(c) That the precautions taken when work is performed on the installation provide protection equivalent to the protection that would be provided by horizontal and vertical clearances meeting ANSI C2-1997.

(2) Except for fuse replacement or other necessary access by qualified persons, the guarding of energized parts within a compartment shall be maintained during operation and maintenance functions to prevent accidental contact with energized parts and to prevent tools or other equipment from being dropped on energized parts.

(3) When guards are removed from energized equipment, barriers shall be installed around the work area to prevent employees who are not working on the equipment, but who are in the area, from contacting the exposed live parts.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48525, filed 3/6/98, effective 5/6/98.]

[Title 296 WAC—p. 1111]

WAC 296-45-48530 Water or steam spaces. The following requirements apply to work in water and steam spaces associated with boilers:

(1) A designated employee shall inspect conditions before work is permitted and after its completion. Eye protection, or full face protection if necessary, shall be worn at all times when condenser, heater, or boiler tubes are being cleaned.

(2) Where it is necessary for employees to work near tube ends during cleaning, shielding shall be installed at the tube ends.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48530, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48535 Chemical cleaning of boilers and pressure vessels. The following requirements apply to chemical cleaning of boilers and pressure vessels:

(1) Areas where chemical cleaning is in progress shall be cordoned off to restrict access during cleaning. If flammable liquids, gases, or vapors or combustible materials will be used or might be produced during the cleaning process, the following requirements also apply:

(a) The area shall be posted with signs restricting entry and warning of the hazards of fire and explosion; and

(b) Smoking, welding, and other possible ignition sources are prohibited in these restricted areas.

(2) The number of personnel in the restricted area shall be limited to those necessary to accomplish the task safely.

(3) There shall be ready access to water or showers for emergency use.

Note: See chapter 296-24 WAC, Part B for requirements that apply to the water supply and to washing facilities.

(4) Employees in restricted areas shall wear protective equipment meeting the requirements of this chapter and including, but not limited to, protective clothing, boots, goggles, and gloves.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48535, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48540 Chlorine systems. (1) Chlorine system enclosures shall be posted with signs restricting entry and warning of the hazard to health and the hazards of fire and explosion.

Note: See chapter 296-62 WAC for requirements necessary to protect the health of employees from the effects of chlorine.

(2) Only designated employees may enter the restricted area. Additionally, the number of personnel shall be limited to those necessary to accomplish the task safely.

(3) Emergency repair kits shall be available near the shelter or enclosure to allow for the prompt repair of leaks in chlorine lines, equipment, or containers.

(4) Before repair procedures are started, chlorine tanks, pipes, and equipment shall be purged with dry air and isolated from other sources of chlorine.

(5) The employer shall ensure that chlorine is not mixed with materials that would react with the chlorine in a dangerously exothermic or other hazardous manner.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48540, filed 3/6/98, effective 5/6/98.]

[Title 296 WAC—p. 1112]

WAC 296-45-48545 Boilers. (1) Before internal furnace or ash hopper repair work is started, overhead areas shall be inspected for possible falling objects. If the hazard of falling objects exists, overhead protection such as planking or nets shall be provided.

(2) When opening an operating boiler door, employees shall stand clear of the opening of the door to avoid the heat blast and gases which may escape from the boiler.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48545, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48550 Turbine generators. (1) Smoking and other ignition sources are prohibited near hydrogen or hydrogen sealing systems, and signs warning of the danger of explosion and fire shall be posted.

(2) Excessive hydrogen makeup or abnormal loss of pressure shall be considered as an emergency and shall be corrected immediately.

(3) A sufficient quantity of inert gas shall be available to purge the hydrogen from the largest generator.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48550, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48555 Coal and ash handling. (1) Only designated persons may operate railroad equipment.

(2) Before a locomotive or locomotive crane is moved, a warning shall be given to employees in the area.

(3) Employees engaged in switching or dumping cars may not use their feet to line up drawheads.

(4) Drawheads and knuckles may not be shifted while locomotives or cars are in motion.

(5) When a railroad car is stopped for unloading, the car shall be secured from displacement that could endanger employees.

(6) An emergency means of stopping dump operations shall be provided at railcar dumps.

(7) The employer shall ensure that employees who work in coal- or ash-handling conveyor areas are trained and knowledgeable in conveyor operation and in the requirements of this section.

(8) Employees may not ride a coal- or ash-handling conveyor belt at any time. Employees may not cross over the conveyor belt, except at walkways, unless the conveyor's energy source has been de-energized and has been locked out or tagged in accordance with WAC 296-45-175.

(9) A conveyor that could cause injury when started may not be started until personnel in the area are alerted by a signal or by a designated person that the conveyor is about to start.

(10) If a conveyor that could cause injury when started is automatically controlled or is controlled from a remote location, an audible device shall be provided that sounds an alarm that will be recognized by each employee as a warning that the conveyor will start and that can be clearly heard at all points along the conveyor where personnel may be present. The warning device shall be actuated by the device starting the conveyor and shall continue for a period of time before the conveyor starts that is long enough to allow employees to move clear of the conveyor system. A visual warning may be used in place of the audible device if the employer can dem-

onstrate that it will provide an equally effective warning in the particular circumstances involved.

Exception: If the employer can demonstrate that the system's function would be seriously hindered by the required time delay, warning signs may be provided in place of the audible warning device. If the system was installed before November 20, 1995, warning signs may be provided in place of the audible warning device until such time as the conveyor or its control system is rebuilt or rewired. These warning signs shall be clear, concise, and legible and shall indicate that conveyors and allied equipment may be started at any time, that danger exists, and that personnel must keep clear. These warning signs shall be provided along the conveyor at areas not guarded by position or location.

(11) Remotely and automatically controlled conveyors, and conveyors that have operating stations which are not manned or which are beyond voice and visual contact from drive areas, loading areas, transfer points, and other locations on the conveyor path not guarded by location, position, or guards shall be furnished with emergency stop buttons, pull cords, limit switches, or similar emergency stop devices. However, if the employer can demonstrate that the design, function, and operation of the conveyor do not expose an employee to hazards, an emergency stop device is not required.

(a) Emergency stop devices shall be easily identifiable in the immediate vicinity of such locations.

(b) An emergency stop device shall act directly on the control of the conveyor involved and may not depend on the stopping of any other equipment.

(c) Emergency stop devices shall be installed so that they cannot be overridden from other locations.

(12) Where coal-handling operations may produce a combustible atmosphere from fuel sources or from flammable gases or dust, sources of ignition shall be eliminated or safely controlled to prevent ignition of the combustible atmosphere.

Note: Locations that are hazardous because of the presence of combustible dust are classified as Class II hazardous locations. See chapter 296-24 WAC, Part L.

(13) An employee may not work on or beneath overhanging coal in coal bunkers, coal silos, or coal storage areas, unless the employee is protected from all hazards posed by shifting coal.

(14) An employee entering a bunker or silo to dislodge the contents shall wear a body harness with lifeline attached. The lifeline shall be secured to a fixed support outside the bunker and shall be attended at all times by an employee located outside the bunker or facility.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48555, filed 3/6/98, effective 5/6/98.]

WAC 296-45-48560 Hydroplants and equipment.

Employees working on or close to water gates, valves, intakes, forebays, flumes, or other locations where increased or decreased water flow or levels may pose a significant hazard shall be warned and shall vacate such dangerous areas before water flow changes are made.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-48560, filed 3/6/98, effective 5/6/98.]

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WAC 296-45-525 Special conditions.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-525, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52505 Capacitors. The following additional requirements apply to work on capacitors and on lines connected to capacitors.

Note: See WAC 296-45-335 through 296-45-345 for requirements pertaining to the de-energizing and grounding of capacitor installations.

(1) Before employees work on capacitors, the capacitors shall be disconnected from energized sources and, after a wait of at least 5 minutes from the time of disconnection, short-circuited.

(2) Before the units are handled, each unit in series-parallel capacitor banks shall be short-circuited between all terminals and the capacitor case or its rack. If the cases of capacitors are on ungrounded substation racks, the racks shall be bonded to ground.

(3) Any line to which capacitors are connected shall be short-circuited before it is considered de-energized.

(4) After removal from service, short circuits shall remain on capacitors in storage until returned to service.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52505, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52510 Current transformer secondaries. The secondary of a current transformer may not be opened while the transformer is energized. If the primary of the current transformer cannot be de-energized before work is performed on an instrument, a relay, or other section of a current transformer secondary circuit, the circuit shall be bridged so that the current transformer secondary will not be opened.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52510, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52515 Series streetlighting. (1) If the open-circuit voltage exceeds 600 volts, the series streetlighting circuit shall be worked in accordance with WAC 296-45-215 or 296-45-385, as appropriate.

(2) A series loop may only be opened after the streetlighting transformer has been de-energized and isolated from the source of supply or after the loop is bridged to avoid an open-circuit condition.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52515, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52520 Illumination. Sufficient illumination shall be provided to enable the employee to perform the work safely.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52520, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52525 Protection against drowning. (1) Whenever an employee may be pulled or pushed or may fall into water where the danger of drowning exists, the employee shall be provided with and shall use U.S. Coast Guard approved personal flotation devices.

(2) Each personal flotation device shall be maintained in safe condition and shall be inspected frequently enough to ensure that it does not have rot, mildew, water saturation, or any other condition that could render the device unsuitable for use.

(3) An employee may cross streams or other bodies of water only if a safe means of passage, such as a bridge, is provided.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52525, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52530 Employee protection in public work areas. (1) Traffic control signs and traffic control devices used for the protection of employees shall meet the requirements of chapter 296-155 WAC, Part E.

(2) Before work is begun in the vicinity of vehicular or pedestrian traffic that may endanger employees, warning signs or flags and other traffic control devices shall be placed in conspicuous locations to alert and channel approaching traffic.

(3) Where additional employee protection is necessary, barricades shall be used.

(4) Excavated areas shall be protected with barricades.

(5) At night, warning lights shall be prominently displayed.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52530, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52535 Backfeed. If there is a possibility of voltage backfeed from sources of cogeneration or from the secondary system (for example, backfeed from more than one energized phase feeding a common load), the requirements of WAC 296-45-325 apply if the lines or equipment are to be worked as energized, and the requirements of WAC 296-45-335 and 296-45-345 apply if the lines or equipment are to be worked as de-energized.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52535, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52540 Lasers. Laser equipment shall be installed, adjusted, and operated in accordance with WAC 296-155-155.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52540, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52545 Hydraulic fluids. Hydraulic fluids used for the insulated sections of equipment shall provide insulation for the voltage involved.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52545, filed 3/6/98, effective 5/6/98.]

WAC 296-45-52550 Foreign attachments and placards. Nails and unauthorized attachments should be removed before climbing above such attachments. When through bolts present a hazard to climbing, they shall be trimmed to a safe length.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-52550, filed 3/6/98, effective 5/6/98.]

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WAC 296-45-545 Trolley maintenance, jumpering or bypassing. (1) Energized trolley wire shall be jumpered when it is to be opened or cut.

(2) Reaching over trolley wire(s) or system(s). Lineworkers shall not reach over trolley wire(s) unless properly protected by line hose or rubber blanket.

(3) Reaching across sectional insulators. Lineworkers shall not reach across section insulator(s), insulated spacer(s) or insulated approach.

(4) Polarity on either side of sectionalizing breakers. Since the polarity on both sides of a sectionalizing insulator may be different, it is required that prior to performance of work, tests be performed with approved testing equipment to determine whether or not the polarity is the same or different on one side of the sectional insulator as compared with the other.

(5) Working on hangers. More than one truck crew shall not work on hangers attached to the same span at the same time, without rubber protection.

(6) Workers on hangers of opposite polarity. Trolley hangers and ears of opposite polarity shall not be worked on at the same time when trolley wire is energized.

(7) Checking electric switches. When electric switches are checked for operation, making it necessary to short circuit the contactor to each trolley wire, tools with insulated handles shall be used.

(8) Short circuit due to use of noninsulated or conductive long handled tools. When a hazard of short circuit exists, due to use of noninsulated or conductive long handled tools, approved protective rubber equipment shall be used as provided in this chapter.

(9) Trolley feeders. When work is to be performed on street railway trolley feeders where it is necessary for workers to work from metal or other grounded poles or fixtures or on poles or fixtures on which grounds are maintained, the feeders shall be de-energized unless the poles or fixtures are insulated before the work is started with approved protective devices in such manner that employees cannot become grounded while working on the feeders, and employees shall wear approved rubber gloves.

(10) Truck driver shall remain at tower controls while workers are working on towers except when the aerial manlift equipment has been properly chocked to prevent uncontrolled movement. Tower trucks shall be equipped with a reliable signaling device between the employees working on the tower and the truck driver.

(11) Working on truck towers. Employees shall not stand on tower gates or railings. Work shall not be done from plank(s) placed on tower railings.

(12) Tower truck railings. Towers shall have standard railings and toeboards around the tower and all railings shall be constructed of wood, fiberglass or other nonmetallic material. All railings shall be a vertical height of not less than 36 inches or more than 42 inches from the floor of the platform to the upper surface of the top rail. Intermediate railings shall be midway between the floor and the underside of the top rail. Tower gates shall be so constructed as to prevent accidental opening.

(13) Tower truck decks shall be kept clear of tools, wire and other materials and tools shall be kept in proper storage area when not in use.

(14) Lineworkers shall not wear climbers or spurs while working on a tower truck.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-545, filed 3/6/98, effective 5/6/98.]

WAC 296-45-675 Rotorcraft/helicopter for power distribution and transmission line installation, construction and repair—Scope. (1) These standards which include WAC 296-45-675 shall apply to work being done on or near any rotorcraft, helicopter crane, or similar device when such device is for power distribution and transmission line construction, alteration, repair or similar work. These standards include work practices when such equipment is being or is about to be used and shall apply to the exclusion of any other standard should such other standard be in conflict with the standards contained herein.

(2) These rules shall be interpreted where necessary to achieve the protection of employees affected by the hazards particular to the helicopter operation and shall be so interpreted as not to conflict with any federal law or regulation governing the operation or maintenance of such craft.

[Order 76-38, § 296-45-675, filed 12/30/76.]

WAC 296-45-67503 Definitions. (1) "Cargo hooks." A device attached or suspended from an aircraft which is used to connect an external load to the aircraft through direct couplings or by lead lines. This unit has both mechanical and electrical locking/unlocking means.

(2) "Designated employees." Those employees selected or designated by the employer to work under or near helicopters who have first been instructed in hooking, unhooking, guiding and securing the load, including the signalperson, all of whom have been instructed in the hazards of helicopter work and who know the provisions of this section.

(3) "Downwash." A down and outward air column from the main rotor system.

(4) "Ground personnel or crew." Those employees who are physically and mentally capable, who are familiar with the hazards of helicopter use in power distribution and transmission line work, and who know these rules and the methods of operation.

(5) "Helicopter," "helicopter crane," and "rotorcraft." Those aircraft whose support in the air is derived solely from the reaction of a stream of air driven downward by propellers revolving around a vertical axis, which are designed for and capable of carrying external loads. The use of the word helicopter in these rules shall also mean helicopter crane, rotorcraft, or similar device.

(6) "Hooking and unhooking." That process by which an external load is either attached to or released from the cargo hook.

(7) "Positive guide system." A system or method of installing a load into position so that the load is capable of being released from the helicopter without being otherwise secured so that the load will remain in position permanently or until otherwise secured by physical means.

(2001 Ed.)

(8) "Rotors." That system of blades which rotates or revolves to supply lift or direction to the rotorcraft.

(9) "Approved rubber gloves." Rubber insulating gloves used for protection of electrical workers from electric shock while working on energized conductors and equipment.

(10) "Signalperson." That member of the ground crew that is designated by an employer to direct, signal and otherwise communicate with the operator of the helicopter.

(11) "Sling line." A strap, chain, rope or the like used to securely hold something being lifted, lowered, carried or otherwise suspended.

(12) "Sock line." A rope(s), cable(s) or similar line(s) which is used to pull a conductor line from a reel or to remove existing strung conductors from poles or towers.

(13) "Static charge." A stationary charge of electricity.

(14) "Tag line." A rope or similar device used to guide or control the direction or movement of a load.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-67503, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67503, filed 12/30/76.]

WAC 296-45-67505 Briefing. (1) Before work or a job involving helicopters begins, there shall be a discussion between all affected employees which shall include the ground crew, signalperson and pilot or operator of the helicopter. The discussion shall cover the particular hazards of the job, the methods of performing the work and the signals to be used. All employees shall, before the beginning of such work or job, understand in detail the hazards, the methods and the signals to be used and these regulations.

(2) Every employee before being allowed to work on or near helicopter(s) operating with or without load shall be advised and understand the hazards involved, the methods of performing the work, the signals being used and these regulations.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-67505, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67505, filed 12/30/76.]

WAC 296-45-67507 Signals. (1) The signals between the signalperson and the operator of the helicopter shall be those submitted to the Federal Aviation Agency for the particular procedure or job. In the event no signals have been submitted to the Federal Aviation Administration, a system of signaling shall be used which has been reduced to writing and which is capable of being clearly understood by all employees and others involved in the job.

(2) Should there occur a change in the hazards, method of performing the job, signals to be used, or other operating conditions during the course of any particular job, a conference shall immediately be held at which time all affected employees and others, including signalpersons, groundworkers, pilot(s), will be advised of such hazards or change of operation. No employee shall be permitted to work unless such employee and others fully understand the change(s) which have taken place.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-67507, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67507, filed 12/30/76.]

WAC 296-45-67509 Slings and tag lines. (1) Loads shall be properly slung so that there will be no slippage or shifting of the load and so that the load will not accidentally be dislodged from the helicopter.

(2) Tag lines shall be of such length as not to be capable of being accidentally drawn into or otherwise entering into the rotors.

(3) Pressed sleeves, wedged eyes, or equivalent means shall be used for all suspended loads.

[Order 76-38, § 296-45-67509, filed 12/30/76.]

WAC 296-45-67511 Cargo hooks. (1) All electrically operated cargo hooks shall have the electrical activating device which is so designed and installed as to prevent inadvertent or accidental operation. Such cargo hooks shall be equipped with an emergency mechanical or manual control for releasing the load. The electrical control shall be a double button single hand control.

(2) No electrical cargo hook shall be used unless, prior to that day's operation, the releases are tested and functioning properly, both electrically and mechanically (manually).

(3) No employee shall be permitted to work under a hovering helicopter(s) unless the cargo hooks used comply with Federal Aviation Administration regulations governing such hooks.

[Order 76-38, § 296-45-67511, filed 12/30/76.]

WAC 296-45-67513 Personal protective equipment. Personal protective equipment when working on, under or in the near vicinity of helicopters:

(1) All employees shall wear eye protection of such design as to prevent the likelihood of dust or other substances from contacting the eye(s) of employees.

(2) All employees shall wear hard hats which shall be secured on the employee's head by a chinstrap.

[Order 76-38, § 296-45-67513, filed 12/30/76.]

WAC 296-45-67515 Wearing apparel. No employee shall wear clothing or apparel which is either designed to or in fact can reasonably be expected to flap or otherwise react in a similar fashion in the downwash or air disturbance of a helicopter(s). No employee shall work on, under or in the near vicinity of a helicopter while wearing such apparel or clothing which flaps or moves to the extent that it presents a hazard in that it could be caught in the moving equipment, the hoist line, or otherwise interfere with the safe performance of the work.

[Order 76-38, § 296-45-67515, filed 12/30/76.]

WAC 296-45-67517 Loose gear and objects. All loose gear, including lunch boxes, rope, cardboard, wire covers and similar items shall be removed or secured or otherwise made fast before the helicopter is started or allowed to approach such area. In the event the gear is not secured or fastened, it shall be removed and located outside the downwash at least 100 feet from the helicopter.

[Order 76-38, § 296-45-67517, filed 12/30/76.]

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WAC 296-45-67519 Housekeeping. All helicopter landing, loading and unloading areas shall be maintained in a neat and orderly fashion so as to reduce the likelihood of flying materials, tripping, or other hazards attendant to the work being performed.

[Order 76-38, § 296-45-67519, filed 12/30/76.]

WAC 296-45-67521 Operator's responsibility. (1) The helicopter operator shall be responsible for the size, weight and manner in which loads are connected to the helicopter.

(2) No load shall be made if the helicopter operator believes the lift cannot safely be performed. The employer shall make certain that the operator of the helicopter is able to freely exercise their prerogative and judgment as to safe operation of the helicopter itself concerning size, weight and manner by which loads are connected.

(3) No employee shall work on, under, near or in conjunction with a helicopter whose operation does not correspond with the foregoing provisions.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-67521, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67521, filed 12/30/76.]

WAC 296-45-67523 Hooking and unhooking loads. No employee shall perform work under hovering helicopters: Provided, That qualified and capable employees may function under such craft for that limited period of time necessary to guide, secure, hook or unhook the loads. When guiding, securing, hooking or unhooking the load at elevated positions, employees shall be assisted by and use a positive positioning guide system. When under hovering helicopters at any other location, the employee shall have a safe means of ingress and egress, including readily available escape route or routes in the event of an emergency. No other work or work-related activity other than the aforementioned shall be permitted under hovering helicopters. Bolting of or otherwise permanently securing the structures is prohibited under hovering helicopters except that in the event of an unforeseen contingency of an emergency nature which represents a substantial hazard to life or property, an employee may do such work as is necessary to preserve life or protect substantial property.

[Order 76-38, § 296-45-67523, filed 12/30/76.]

WAC 296-45-67525 Static charge. All loads shall be grounded with a grounding device capable of discharging either the actual or potential static charge before ground personnel either touch or come close enough to touch the suspended load, or protective rubber gloves shall be worn by all ground personnel either touching the suspended load or who are likely to touch the load.

[Order 76-38, § 296-45-67525, filed 12/30/76.]

WAC 296-45-67527 Load permitted. (1) Weight of the external load shall not exceed the manufacturer's load limit.

(2) A helicopter shall not pull any cable, rope or similar line which is at any point attached to a fixed object other than

the helicopter itself. Helicopters may pull a free-wheeling sock line so long as the end of the sock line is not tied to a reel, truck, or other fixed object. Such line cannot be tied to or otherwise secured to the roll-off reel other than by having been wrapped around such reel.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-67527, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67527, filed 12/30/76.]

WAC 296-45-67529 Visibility. Employees shall keep clear of and outside the downwash of the helicopters except as necessary to perform a permitted activity. Where reasonably practicable, reduced vision of the operator and ground crew shall be eliminated.

[Order 76-38, § 296-45-67529, filed 12/30/76.]

WAC 296-45-67531 Signal systems. (1) Communication shall be maintained between the air crew and ground personnel at all times. Such signal systems shall be understood by the air crew and the ground crew, including signalpersons, prior to the hoisting of any load. There shall be constant radio and hand signals used. The signalperson shall have the sole and exclusive function during periods of loading and unloading of signaling and maintaining communications with the pilot. The signalperson shall be so dressed as to make their appearance distinguishable from other members of the ground crew by the operator of the craft. This may be by way of orange-colored gloves, vest, or other wearing apparel. In addition, the leadworker and one top person shall also have an operating transmitter and receiver.

(2) Designated employees may come within 50 feet of the helicopter when the rotor blades are turning, but no closer, other than to enter the craft or to hook or unhook the load or do other essential functions. Other employee(s) shall not come closer than 100 feet of the craft when it is operating.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-67531, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67531, filed 12/30/76.]

WAC 296-45-67533 Approaching the helicopter. Whenever approaching or leaving a helicopter with blades rotating, all employees shall remain in full view of pilot or operator and remain in a crouched position if within 50 feet of the helicopter. No employee shall approach the rear of the helicopter unless directly authorized and directed by the operator of such craft to be there at that time. All employees when operating or working within 50 feet of the helicopter with blades turning are subject to the direction of the helicopter operator. No employee shall enter or leave the helicopter unless and until the place at which they enter or leave such craft is large enough for the helicopter itself to land.

[Order 76-38, § 296-45-67533, filed 12/30/76.]

WAC 296-45-67535 In helicopter. (1) While in the helicopter, safety belts will remain fastened at all times except when pilot or operator instructs otherwise or while entering or leaving the helicopter.

(2) No smoking in the helicopter unless otherwise permitted by the pilot.

(2001 Ed.)

(3) All rack cargo will be secured prior to and during takeoff and flight.

(4) All internal cargo will be secured or otherwise held.

(5) No gear shall be thrown toward or placed in front of the cockpit on or near plexiglass enclosure.

(6) No employee shall lean against or rub the plexiglass.

(7) No employee shall ride in or work under or near a helicopter with less than 15 minutes reserve fuel.

(8) No employee shall have sharp objects in their pocket while sitting in or on the helicopter.

(9) No employee shall touch any switch, knob, instrument, or other control or device in the cockpit unless specifically directed by the operator.

(10) No cargo shall be thrown into pans or cargo rack.

(11) No employee shall obscure or otherwise obstruct the pilot's ability to visually see the instruments or flight path during flight or operation.

(12) No employee shall attempt to slow or stop the rotorcraft blades by hand unless directed or instructed to do so and aided by the pilot.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-45-67535, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67535, filed 12/30/76.]

WAC 296-45-67537 Sling and rigging. (1) The sling used for the external load shall be inspected each day before use. An employee designated as rigger, who shall be capable of properly inspecting the rigging, shall inspect the sling.

(2) No sling shall be used unless it has a minimum tensile strength of four times the load which will be carried or is being carried.

(3) No sling shall be used unless upon inspection it is determined to be in good condition and capable of the work which is to be performed.

[Order 76-38, § 296-45-67537, filed 12/30/76.]

WAC 296-45-67539 Personnel. All ground personnel shall be physically and mentally able to perform the work to which they are assigned, including being knowledgeable in these rules. There shall be a sufficient number of ground personnel so as to be able to safely guide, secure, hook and unhook the load.

[Order 76-38, § 296-45-67539, filed 12/30/76.]

WAC 296-45-67541 Fires. Open fires shall not be permitted in any area in which said fires will be affected by the downwash of the rotors, nor shall any employee smoke in an area subject to the downdraft of the rotor.

[Order 76-38, § 296-45-67541, filed 12/30/76.]

WAC 296-45-67543 General. No employee shall work under or in the near vicinity of helicopters unless the operator has a valid license for operating the craft, knows the signals to be used, has been present at the last briefing held and knows these rules. No employee shall work under or near such craft if the operator is under the influence of intoxicating beverages or prescription medications which affect his/her ability, nor shall any employee work under or near such craft

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if the operator is careless or engages in any negligent or reckless operation of the helicopter.

[Statutory Authority: Chapter 49.17 RCW, 94-20-057 (Order 94-16), § 296-45-67543, filed 9/30/94, effective 11/20/94; Order 76-38, § 296-45-67543, filed 12/30/76.]

WAC 296-45-67545 Refueling operations. (1) Under no circumstances shall the refueling of any type helicopter with either aviation gasoline or Jet B (Turbine) type fuel be permitted while the engines are running.

(2) Helicopters using Jet A (Turbine-Kerosene) type fuel may be refueled with engines running provided the following criteria is met:

(a) No unauthorized persons shall be allowed within fifty feet of the refueling operation or fueling equipment.

(b) A minimum of one thirty-pound fire extinguisher, or a combination of same, good for class A, B and C fires, shall be provided within one hundred feet on the upwind side of the refueling operation.

(c) All fueling personnel shall be thoroughly trained in the refueling operation and in the use of the available fire extinguishing equipment they may be expected to utilize.

(d) There shall be no smoking, open flames, exposed flame heaters, flare pots, or open flame lights within fifty feet of the refueling area or fueling equipment. All entrances to the refueling area shall be posted with "NO SMOKING" signs.

(e) Due to the numerous causes of static electricity, it shall be considered present at all times. Prior to starting refueling operations, the fueling equipment and the helicopter shall be grounded and the fueling nozzle shall be electrically bonded to the helicopter. The use of conductive hose shall not be accepted to accomplish this bonding. All grounding and bonding connections shall be electrically and mechanically firm, to clean unpainted metal parts.

(f) To control spills, fuel shall be pumped either by hand or power. Pouring or gravity flow shall not be permitted. Self-closing nozzles or deadman controls shall be used and shall not be blocked open. Nozzles shall not be dragged along the ground.

(g) In case of a spill, the fueling operation shall be immediately stopped until such time as the person-in-charge determines that it is safe to resume the refueling operation.

(h) When ambient temperatures have been in the one hundred degrees Fahrenheit range for an extended period of time, all refueling of helicopters with the engines running shall be suspended until such time as conditions become suitable to resume refueling with the engines running.

(3) Helicopters with their engines stopped being refueled with aviation gasoline or Jet B (Turbine) type fuel, shall also comply with subsection (2)(a) through (g) of this section.

[Statutory Authority: Chapter 49.17 RCW, 89-11-035 (Order 89-03), § 296-45-67545, filed 5/15/89, effective 6/30/89.]

WAC 296-45-900 Appendices. Nonmandatory.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-900, filed 3/6/98, effective 5/6/98.]

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WAC 296-45-901 Appendix A—Nonmandatory.

Appendix A—Tables

TABLE 2
AC Live Work Minimum Approach Distance
With Transient Overvoltage Factor

Maximum anticipated per-unit transient over-voltage	Distance to employee in feet-inches, phase to ground						
	Air and clear live-line tool						
	Maximum phase-to-phase voltage in kilovolts						
	121	145	169	242	362	550	800
1.5						6-0	9-8
1.6						6-6	10-8
1.7						7-0	11-8
1.8						7-7	12-8
1.9						8-1	13-9
2.0	2-5	2-9	3-0	3-10	5-3	8-9	14-11
2.1	2-6	2-10	3-2	4-0	5-5	9-4	
2.2	2-7	2-11	3-3	4-1	5-9	9-11	
2.3	2-8	3-0	3-4	4-3	6-1	10-6	
2.4	2-9	3-1	3-5	4-5	6-4	11-3	
2.5	2-9	3-2	3-6	4-6	6-8		
2.6	2-10	3-3	3-8	4-8	7-1		
2.7	2-11	3-4	3-9	4-10	7-5		
2.8	3-0	3-5	3-10	4-11	7-9		
2.9	3-1	3-6	3-11	5-1	8-2		
3.0	3-2	3-7	4-0	5-3	8-6		

- Note 1: The distances specified in this table may be applied only where the maximum anticipated per-unit transient overvoltage has been determined by engineering analysis and has been supplied by the employer. Table 1 applies otherwise.
- Note 2: The distances specified in this table are the air, and live-line tool distances.

TABLE 3
AC Live Work Minimum Approach Distance
With Transient Overvoltage Factor

Maximum anticipated per-unit transient over-voltage	Distance to employee in feet-inches, phase to ground						
	Air and clear live-line tool						
	Maximum phase-to-phase voltage in kilovolts						
	121	145	169	242	362	550	800
1.5						7-4	12-1
1.6						8-9	14-6
1.7						10-2	17-2
1.8						11-7	19-11
1.9						13-2	22-11
2.0	3-7	4-1	4-8	6-1	8-7	14-10	26-0
2.1	3-7	4-2	4-9	6-3	8-10	15-7	
2.2	3-8	4-3	4-10	6-4	9-2	16-4	
2.3	3-9	4-4	4-11	6-6	9-6	17-2	
2.4	3-10	4-5	5-0	6-7	9-11	18-1	
2.5	3-11	4-6	5-2	6-9	10-4		
2.6	4-0	4-7	5-3	6-11	10-9		
2.7	4-1	4-8	5-4	7-0	11-2		
2.8	4-1	4-9	5-5	7-2	11-7		
2.9	4-2	4-10	5-6	7-4	12-1		
3.0	4-3	4-11	5-8	7-6	12-6		

- Note 1: The distances specified in this table may be applied only where the maximum anticipated per-unit transient overvoltage has been determined by engineering analysis and has been supplied by the employer. Table 1 applies otherwise.
- Note 2: The distances specified in this table are the air, and live-line tool distances.

Maximum anticipated per-unit transient overvoltage	Distance to employee in feet-inches, conductor to ground				
	Air and clear live-line tool				
	Maximum phase-to-phase voltage in kilovolts				
	250	400	500	600	750
1.5 or lower	3-8	5-3	6-9	8-7	11-10
1.6	3-10	5-7	7-4	9-5	13-1
1.7	4-1	6-0	7-11	10-3	14-4
1.8	4-3	6-5	8-7	11-2	15-9

Note 1: The distances specified in this table may be applied only where the maximum anticipated per-unit transient overvoltage has been determined by engineering analysis and has been supplied by the employer. However, if the transient overvoltage factor is not known, a factor of 1.8 shall be assumed.

Note 2: The distances specified in this table are the air, and live-line tool distances.

Altitude		Correction factor
(m)	(ft)	
900	3000	1.00
1200	4000	1.02
1500	5000	1.05
1800	6000	1.08
2100	7000	1.11
2400	8000	1.14
2700	9000	1.17
3000	10,000	1.20
3600	12,000	1.25
4200	14,000	1.30
4800	16,000	1.35
5400	18,000	1.39
6000	20,000	1.44

Note: If the work is performed at elevations greater than 3000 ft (900 m) above mean sea level, the minimum approach distance shall be determined by multiplying the distances in Table 1 through Table 4 by the correction factor corresponding to the altitude at which work is performed.

[Statutory Authority: RCW 49.17.040, 99-09-080, § 296-45-901, filed 4/20/99, effective 8/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-901, filed 3/6/98, effective 5/6/98.]

WAC 296-45-903 Appendix B—Protection from step and touch potentials—Nonmandatory.

I. "Introduction"

When a ground fault occurs on a power line, voltage is impressed on the "grounded" object faulting the line. The voltage to which this object rises depends largely on the voltage on the line, on the impedance of the faulted conductor, and on the impedance to "true," or "absolute," ground represented by the object. If the object causing the fault represents a relatively large impedance, the voltage impressed on it is essentially the phase-to-ground system voltage. However, even faults to well grounded transmission towers or substation structures can result in hazardous voltages.⁽¹⁾ The degree of the hazard depends upon the magnitude of the fault current and the time of exposure.

Footnote⁽¹⁾ This appendix provides information primarily with respect to employee protection from contact between equipment being used and an energized power line. The information presented is also relevant to ground faults to transmission towers and substation structures; however, grounding systems for these structures should be

designed to minimize the step and touch potentials involved.

II. "Voltage-gradient distribution"

A. Voltage-gradient distribution curve

The dissipation of voltage from a grounding electrode (or from the grounded end of an energized grounded object) is called the ground potential gradient. Voltage drops associated with this dissipation of voltage are called ground potentials. Figure A is a typical voltage-gradient distribution curve (assuming a uniform soil texture). This graph shows that voltage decreases rapidly with increasing distance from the grounding electrode.

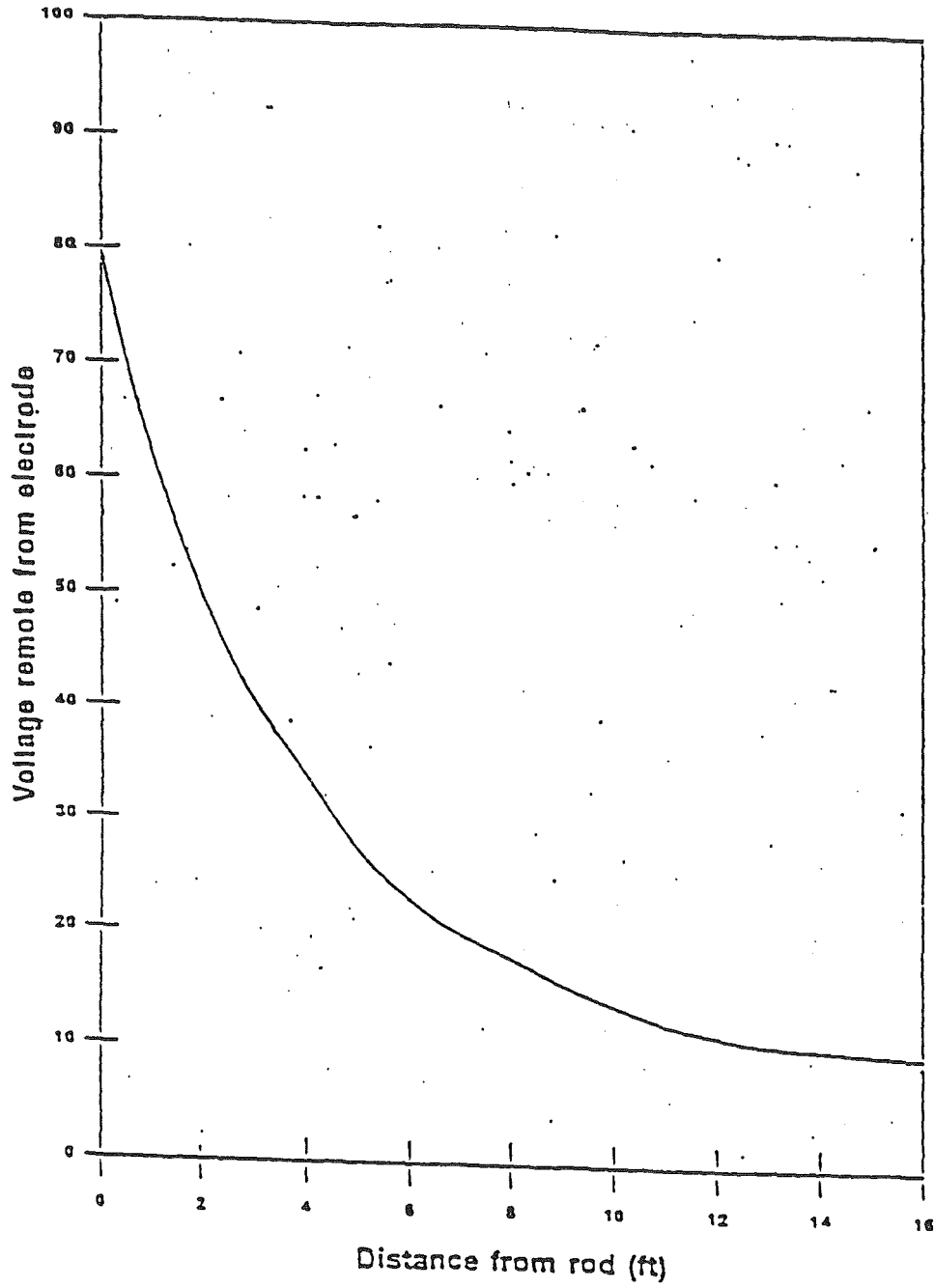


Figure A - Typical Voltage-Gradient Distribution Curve

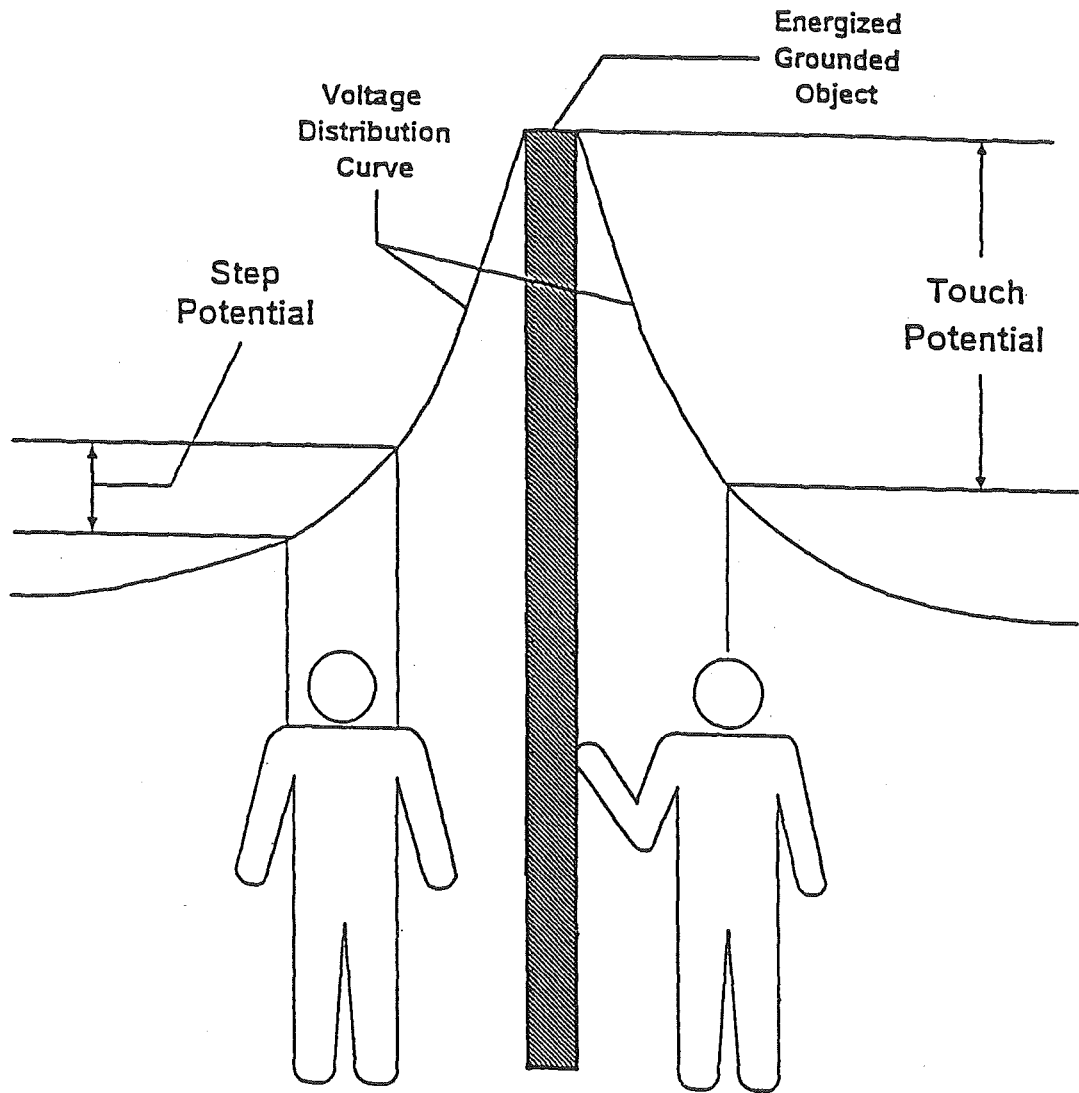


Figure B - Step and Touch Potentials

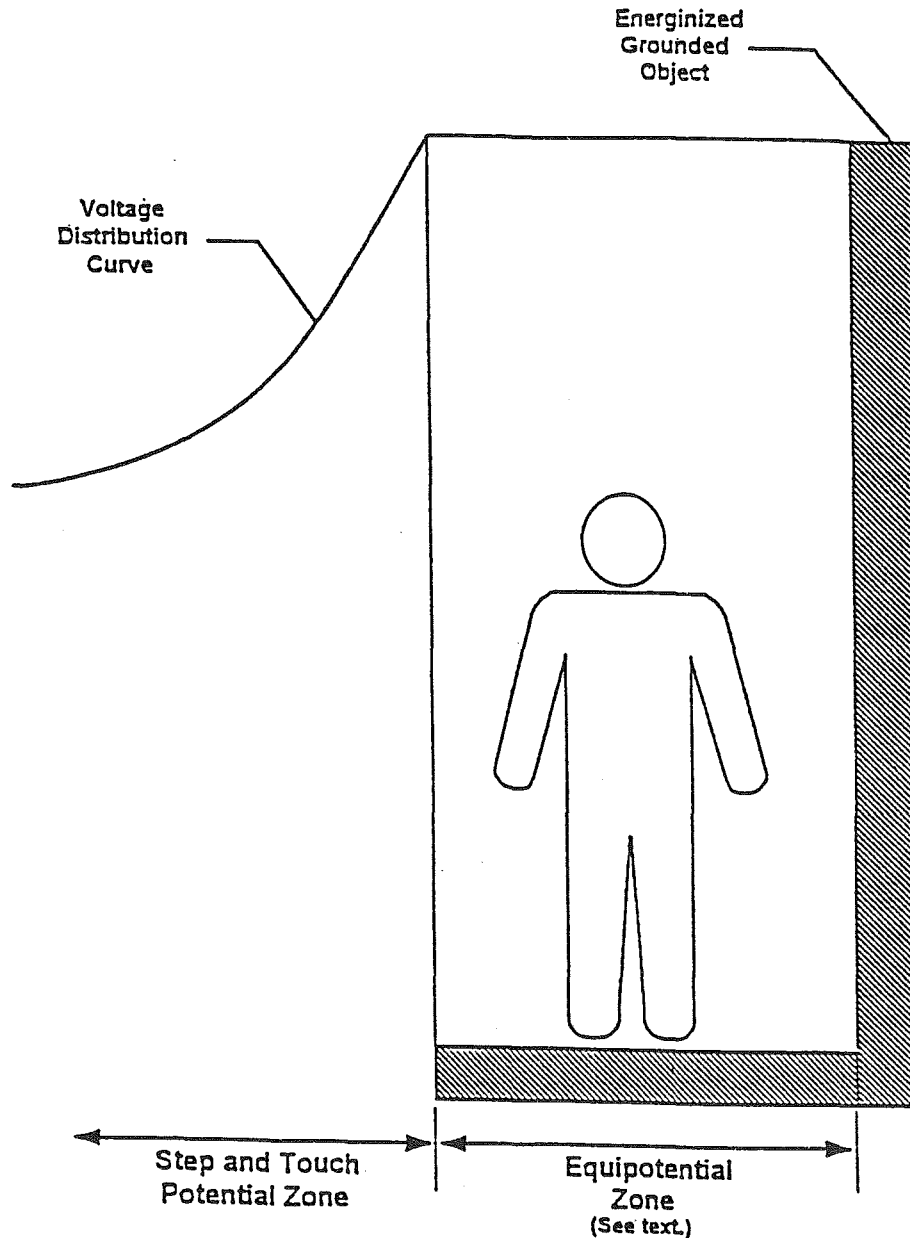


Figure C -- Protection from Ground-Potential Gradients

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-903, filed 3/6/98, effective 5/6/98.]

WAC 296-45-905 Appendix C—Methods of inspecting and testing wood poles—Nonmandatory.

I. "Introduction"

When work is to be performed on a wood pole, it is important to determine the condition of the pole before it is climbed. The weight of the employee, the weight of equipment being installed, and other working stresses (such as the removal or retensioning of conductors) can lead to the failure of a defective pole or one that is not designed to handle the additional stresses.⁽¹⁾ For these reasons, it is essential that an inspection

and test of the condition of a wood pole be performed before it is climbed.

Footnote⁽¹⁾

A properly guyed pole in good condition should, at a minimum, be able to handle the weight of an employee climbing it. If the pole is found to be unsafe to climb or to work from, it must be secured so that it does not fail while an employee is on it.

The pole can be secured by a line truck boom, by ropes or guys, or by lashing a new pole alongside it. If a new one is lashed alongside the defective pole, work should be performed from the new one.

II. "Inspection of wood poles"

Wood poles should be inspected by a qualified employee for the following conditions:⁽²⁾

Footnote⁽²⁾

The presence of any of these conditions is an indication that the pole may not be safe to climb or to work from. The employee performing the inspection must be qualified to make a determination as to whether or not it is safe to perform the work without taking additional precautions.

A. General condition

The pole should be inspected for buckling at the ground line and for an unusual angle with respect to the ground. Buckling and odd angles may indicate that the pole has rotted or is broken.

B. Cracks

The pole should be inspected for cracks. Horizontal cracks perpendicular to the grain of the wood may weaken the pole. Vertical ones, although not considered to be a sign of a defective pole, can pose a hazard to the climber, and the employee should keep his or her gaffs away from them while climbing.

C. Holes

Hollow spots and woodpecker holes can reduce the strength of a wood pole.

D. Shell rot and decay

Rotting and decay are cutout hazards and are possible indications of the age and internal condition of the pole.

E. Knots

One large knot or several smaller ones at the same height on the pole may be evidence of a weak point on the pole.

F. Depth of setting

Evidence of the existence of a former ground line substantially above the existing ground level may be an indication that the pole is no longer buried to a sufficient extent.

G. Soil conditions

Soft, wet, or loose soil may not support any changes of stress on the pole.

H. Burn marks

Burning from transformer failures or conductor faults could damage the pole so that it cannot withstand mechanical stress changes.

III. "Testing of wood poles"

The following tests are recognized as acceptable methods of testing wood poles:

A. Hammer test

Rap the pole sharply with a hammer weighing about 3 pounds, starting near the ground line and continuing upwards circumferentially around the pole to a height of approximately 6 feet. The hammer will produce a clear sound and rebound sharply when striking sound wood. Decay pockets will be indicated by a dull sound or a less pronounced hammer rebound. Also, prod the pole as near the ground line as possible using a pole prod or a screwdriver with a blade at least 5 inches long. If substantial decay is encountered, the pole is considered unsafe.

B. Rocking test

Apply a horizontal force to the pole and attempt to rock it back and forth in a direction perpendicular to the line. Caution must be exercised to avoid causing power lines to swing together. The force may be applied either by pushing with a pike pole or pulling with a rope. If the pole cracks during the test, it shall be considered unsafe.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050 and [49.17].060. 98-07-009, § 296-45-905, filed 3/6/98, effective 5/6/98.]

(2001 Ed.)

Chapter 296-46A WAC

SAFETY STANDARDS—INSTALLING ELECTRIC WIRES AND EQUIPMENT—ADMINISTRATIVE RULES

(Formerly chapter 296-46 WAC)

WAC

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296-46A-600	Electrical signs.
296-46A-680	Electrical equipment associated with spas, hot tubs, swimming pools or hydromassage bathtubs.
296-46A-700	Emergency systems.
296-46A-702	Optional standby systems.
296-46A-900	Electrical work permits and fees.
296-46A-910	Inspection fees.
296-46A-915	Electrical/telecommunications contractor license, administrator certificate and examination, and copy fees.
296-46A-920	Civil penalty.
296-46A-930	Electrical/telecommunications contractor license and administrator certificate designation.
296-46A-931	Electrical/telecommunications contractor license.
296-46A-932	Electrical/telecommunications contractor cash or securities deposit.
296-46A-933	Telecommunications contractor insurance.
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296-46A-935	Electrical utility exemptions.
296-46A-940	Manufacturers of electrical/telecommunications products exemptions.
296-46A-950	Administrator certificate.
296-46A-960	Revocation or suspension of an electrical/telecommunications contractor's license or administrator's certificate.

WAC 296-46A-090 Foreword. (1) The 1999 edition of the National Electrical Code (NFPA 70 - 1999) including Appendixes A, B, and C, the 1996 edition of Centrifugal Fire Pumps (NFPA 20 - 1996), the 1996 edition of Emergency and Standby Power Systems (NFPA 110 - 1996), Commercial Building Telecommunications Cabling Standard

(ANSI/TIA/EIA 568-A-1995 including amendments 1 through 5), Commercial Building Standard for Telecommunications Pathway and Spaces (ANSI/TIA/EIA 569-A-1998 including amendments 1 through 4), Commercial Building Grounding and Bonding Requirements for Telecommunications (ANSI/TIA/EIA 607-1994), Residential Telecommunications Cable Standard (ANSI/TIA/EIA 570-A-1999), and the National Electrical Safety Code (NESC C2-1997 excluding Appendixes A and B) are hereby adopted by reference as part of this chapter. Other codes, manuals, and reference works referred to in this chapter are available for inspection and review in the Olympia office of the electrical section of the department during business hours. The requirements of this chapter will be observed where there is any conflict between this chapter and the National Electrical Code (NFPA 70), Centrifugal Fire Pumps (NFPA 20), the Emergency and Standby Power Systems (NFPA 110), ANSI/TIA/EIA 568-A, ANSI/TIA/EIA 569-A, ANSI/TIA/EIA 607, ANSI/TIA/EIA 570, or the National Electrical Safety Code. The National Electrical Code will be followed where there is any conflict between Centrifugal Fire Pumps (NFPA 20), Emergency and Standby Power Systems (NFPA 110), ANSI/TIA/EIA 568-A, ANSI/TIA/EIA 569-A, ANSI/TIA/EIA 607, ANSI/TIA/EIA 570, or the National Electrical Safety Code and the National Electrical Code (NFPA 70).

(2) Electrical inspectors will give information as to the meaning or application of the standards in subsection (1) of this section and this chapter, but will not lay out work or act as consultants for contractors, owners, or users.

(3) The department may enforce city electrical ordinances where those governmental agencies do not make electrical inspections under an established program.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-090, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-092 General definitions. (1) **All definitions listed in the National Electrical Code and chapter 19.28 RCW are recognized in this chapter unless specific definitions are given in this chapter.**

(2) **"Electrical equipment"** includes electrical conductors, conduit, raceway, apparatus, materials, components, and other electrical equipment.

(3) **"Fished Wiring"** is when cable or conduit is installed within the finished surfaces of an existing building or building structure (e.g., wall, floor or ceiling cavity).

(4) HVAC/refrigeration specific definitions:

(a) **"HVAC/refrigeration"** means heating, ventilation, air conditioning, and refrigeration.

(b) **"HVAC/refrigeration component"** means electrical power and limited energy components within the "HVAC/refrigeration system," including, but not limited to: Pumps, compressors, motors, heating coils, controls, switches, thermostats, humidistats, low voltage damper controls, outdoor sensing controls, outside air dampers, stand-alone duct smoke detectors, air monitoring devices, zone control valves and equipment for monitoring of HVAC/refrigeration control panels and low voltage connec-

tions. This definition excludes equipment and components of "non-HVAC/refrigeration control systems."

(c) **"HVAC/refrigeration control panel"** means an enclosed, manufactured assembly of electrical components designed specifically for the control of a HVAC/refrigeration system. Line voltage equipment that has low voltage, NEC class 2 control or monitoring components incidental to the designed purpose of the equipment is not an HVAC/refrigeration control panel (e.g., combination starters).

(d) **"HVAC/refrigeration control system"** means a network system regulating and/or monitoring a HVAC/refrigeration system. Equipment of a HVAC/refrigeration control system includes, but is not limited to: Control panels, data centers, relays, contactors, sensors, and cables related to the monitoring and control of a HVAC/refrigeration system(s).

(e) **"HVAC/refrigeration equipment"** means the central unit primary to the function of the "HVAC/refrigeration system." HVAC/refrigeration includes, but is not limited to: Heat pumps, swamp coolers, furnaces, compressor packages, and boilers.

(f) **"HVAC/refrigeration system"** means a system of HVAC/refrigeration equipment and HVAC/refrigeration components integrated to generate, deliver, or control heated, cooled, filtered, refrigerated, or conditioned air. This definition excludes equipment and components integral with non-HVAC/refrigeration control systems and line voltage branch circuits, feeders, services, panelboards, and disconnect switches supplying the HVAC/refrigeration system.

(5) **"Field evaluated"** means equipment has been evaluated and identified by a laboratory approved by the state of Washington for the appropriate equipment standard per chapter 296-402A WAC.

(6) **"Final judgment"** means any money that is owed to the department under this chapter or any money that is owed the department as a result of an individual's or a contractor's unsuccessful appeal of an infraction. Final judgment also includes any penalties owed the department as a result of an infraction not appealed or any outstanding fees due under this chapter.

(7) An **"installation"** includes the act of installing, connecting, repairing, modifying, or otherwise performing work on an electrical system, component, equipment, or wire except as allowed by WAC 296-46A-940.

(8) An **"identification plate"** is a phenolic or metallic plate or other similar material engraved in block letters at least 1/4" (6mm) high unless specifically required to be larger by this chapter, suitable for the environment and application. The letters and the background must be in contrasting colors. Screws, rivets, or methods specifically described in chapter 296-46A WAC must be used to affix an identification plate to the equipment or enclosure.

(9) **"License"** means a license required under chapter 19.28 RCW.

(10) **"Like-in-kind"** means having similar characteristics such as voltage requirement, current draw, and function within the system.

(11) **"Listed"** means equipment has been listed and identified by a laboratory approved by the state of Washing-

ton for the appropriate equipment standard per chapter 296-402A WAC.

(12) "**Low voltage**" means:

(a) NEC, Class 1 power limited circuits at 30 volts maximum.

(b) NEC, Class 2 circuits powered by a Class 2 power supply as defined in Article 625-41(a) [725-41(a)] NEC.

(c) NEC, Class 3 circuits powered by a Class 3 power supply as defined in Article 625-41(a) [725-41(a)] NEC.

(d) Telecommunications circuits as defined in chapter 19.28 RCW.

(13) "**NEC**" means National Electrical Code.

(14) "**Point of contact**," for utility work, means the point at which a customer's electrical system connects to the serving utility system.

(15) A "**stand-alone amplified sound or public address system**" is a system that has distinct wiring and equipment for audio signal generation, recording, processing, amplification, and reproduction. This definition does not apply to telecommunications installations.

(16) "**Under the control of a utility**" for the purposes of RCW 19.28.091 is when electrical equipment is owned by the utility or when electrical equipment is not owned by a utility and:

(a) Is located in a vault, room, closet, or similar enclosure that is secured by a lock or seal so that access is restricted to the utility's personnel; or

(b) The utility is obligated by contract to maintain the equipment and the contract provides that access to the equipment is restricted to the utility's personnel or other qualified personnel.

(17) "**Utility**" means an electrical utility.

(18) "**Utility system**" means electrical equipment owned by or under the control of a serving utility that is used for the transmission or distribution of electricity from the source of supply to the point of contact.

(19) "**Utilization voltage**" means the voltage level employed by the utility's customer for connection to lighting fixtures, motors, heaters, or other electrically operated equipment other than power transformers.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-092, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-095 Inspection. (1) Electrical wiring or equipment subject to this chapter must be sufficiently accessible, at the time of inspection, to permit the inspector to visually inspect the installation to verify conformance with the NEC, chapter 19.28 RCW and any other electrical requirements of chapter 296-46A WAC.

(2) Cables or raceways fished according to the NEC do not require visual inspection.

(3) Wires pulled into conduit systems are not considered concealed; except, all required equipment grounding conductors installed in concealed raceway, cable, or flexible conduit systems must be completely installed and made up at the time of the rough-in cover inspection.

(2001 Ed.)

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-095, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-100 Approval for conductors and equipment. (1) In order to meet the minimum electrical safety standards for installations, all materials, devices, appliances, and equipment, not exempted in chapter 19.28 RCW, must conform to applicable standards recognized by the department, be listed, or field evaluated.

(2) Department electrical inspectors may inspect and approve industrial control panels and utilization equipment for compliance with codes, rules, and standards recognized by the department, on a case-by-case basis consistent with chapter 296-46A WAC.

(3) The department will recognize the state department of transportation as the inspection authority for telecommunication systems installation within the rights of way of state highways provided the department of transportation maintains and enforces an equal, higher or better standard of construction and of materials, devices, appliances and equipment than is required for telecommunications systems installations by chapter 19.28 RCW and these rules.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-100, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-102 Industrial control panel inspection. (1) Specific definitions:

(a) "**Food processing plants**" do not include:

(i) Restaurants.

(ii) Farming, ranching, or dairy farming operations.

(b) In chapter 19.28 RCW "**industrial control panel**" means a factory or user wired assembly of industrial control equipment such as motor controllers, switches, relays, power supplies, computers, cathode ray tubes, transducers, and auxiliary devices. The panel may include disconnect means and motor branch circuit protective devices. Industrial control panels include only those used in food processing, industrial, and manufacturing plants.

(c) "**Industrial plants**" do not include:

(i) Municipal or other government facilities.

(ii) Educational facilities or portions thereof.

(iii) Institutional facilities or portions thereof.

(iv) Other installations not used for direct production purposes.

(d) "**Manufacturing plants**" do not include:

(i) Municipal or other government facilities.

(ii) Educational facilities or portions thereof.

(iii) Institutional facilities or portions thereof.

(iv) Other installations not used for direct production purposes.

(v) Home workshops.

(e) "**Normal department inspection**" is a part of the department electrical inspection process included with the general wiring inspection of a building, structure, or other electrical installation.

(f) "**Special department inspection**" is an electrical inspection, made by the department, when an industrial control or utilization equipment is not constructed entirely of listed components.

(g) "**Utilization equipment**" is the machine(s) and its integral components controlled by the "industrial control panel(s)" defined in this section.

(2) Industrial control panels will be determined to meet the minimum electrical safety standards for installations by:

(a) Listing, or field evaluation;

(b) Normal department inspection for compliance with codes and rules adopted under this chapter;

(c) Special department inspection requested by the industrial/control panel owner or agent.

(3) Utilization equipment will be determined to meet the minimum electrical safety standards for equipment by:

(a) Listing, or field evaluation;

(b) Normal department inspection by department electrical inspectors for compliance with codes and rules adopted under this chapter.

(4) Fees for special department inspections required under this chapter; including: Portal to portal inspection time, the time to prepare reports, and state rate per diem travel costs (if applicable); will be calculated under WAC 296-46A-910.

(5) Fees for the normal department inspections required under this chapter are included in the electrical work permit fee calculated for the installation and are not a separate inspection fee.

(6) Requests for special department inspections under this chapter must be on department furnished forms identifying the request as an "industrial control panel" inspection.

(7) Requirements and procedures for a special department inspection:

(a) The department may require that electrical power to the industrial control panel be deenergized and locked out or disconnected while performing the inspection.

(b) The department may authorize use of the industrial control panel before its inspection.

(c) All components of the industrial control panel must be marked in compliance with Article 110-21 NEC. The special inspection requestor must supply a statement from the manufacturer stating the industrial control panel and its components are safe for the intended use and conform to the requirements of the NEC, chapter 296-46A WAC, and other standards currently adopted by the department. This statement must be furnished to the department before a special inspection is performed and will become a part of the permanent special inspection file kept by the department. The department will not approve any component that is not listed, recognized, field evaluated, or manufactured to nationally recognized testing laboratory standards unless the component is protected in a manner approved by the department.

(d) Deficiencies:

(i) Will be referenced by the department citing the appropriate code or rule by publication and section.

(ii) Will be required to be corrected prior to approval by the department.

(iii) Will be required to be corrected and the department notified of such corrections, within fifteen days of the date the deficiency was formally identified by the department.

(iv) A longer time to correct a deficiency(ies) may be requested. The department will determine an appropriate time frame consistent with the reason for the request.

(v) The department may authorize the industrial control panel to be or remain energized and in service while the deficiencies are being corrected.

(vi) A copy of all deficiencies will be given to the requestor when identified by the department.

(e) A copy of the special department inspection report and approval will be given to the owner or operator of the facility and to the special inspection requestor upon final approval and will include:

(i) Pertinent test evaluation data and identification of tests or inspections including anomalies.

(ii) Name of inspection requestor.

(iii) Designation of standards used to certify or test the product including edition and latest revision (e.g., UL 508, 16th Edition, Feb. 1993, Revision Oct. 9, 1997).

(iv) Description and identification of the nonlisted component(s) requiring evaluation or replacement.

(v) Description of the overall product evaluated to include full nameplate data and equipment type.

(vi) Signature of person(s) having responsibility for the report.

(vii) Any condition of acceptability or restrictions on use/relocation.

(viii) Serial number(s) of the special department inspection label(s) applied will be included with the equipment identification.

(ix) The department file identification number.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-102, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-104 Traffic management systems. (1)

A traffic management system includes:

(a) Traffic illumination systems.

(b) Traffic signal systems.

(c) Traffic monitoring systems.

(d) The electrical service cabinet and all related components and equipment installed on the load side of the service cabinet supplying electrical power to the traffic management system.

The department will perform the electrical inspection and acceptance of traffic management systems within its jurisdiction.

(2) The department recognizes that traffic signal conductors, pole and bracket cables, signal displays, and traffic signal controllers/cabinets and associated components used in traffic management systems are acceptable for the purpose of meeting the requirements of chapter 19.28 RCW provided they conform with the following applicable standards or are listed on the Washington state department of transportation (WSDOT) qualified products list.

(a) WSDOT/APWA Standard Specifications and Plans.

(b) WSDOT Design Manual.

- (c) International Municipal Signal Association (IMSA).
- (d) National Electrical Manufacturers Association (NEMA).
- (e) Federal Standards 170/Controller Cabinets.
- (f) Manual for Uniform Road, Bridge, and Municipal Construction.
- (g) Institute of Transportation Engineers (ITE).
- (h) Manual of Uniform Traffic Control Devices (MUTCD).

(3) Associated induction detection loop or similar circuits will be accepted by the department without inspection.

(4) For the licensing requirements of chapter 19.28 RCW, jurisdictions will be considered owners of traffic management systems when doing electrical work for other jurisdiction(s) under a valid interlocal agreement, as permitted by chapter 39.34 RCW. Interlocal agreements for traffic management systems must be filed with the department prior to work being performed for this provision to apply.

(5) Jurisdictions, with an established electrical inspection authority, and WSDOT may perform electrical inspection on their rights-of-way for each other by interlocal agreement. They may not perform electrical inspection on other rights-of-way except as allowed in chapter 19.28 or 39.34 RCW.

(6) Underground installations.

(a) In other than open trenching, raceways will be considered "fished" according to the NEC and do not require visual inspection.

(b) Inspections in open trenching will be conducted by the department within its jurisdiction. The electrical work permit purchaser must coordinate the electrical inspection. A written request (e.g., letter, e-mail, fax, etc.) for inspection, made to the department office having the responsibility to perform the inspection, must be made a minimum of two working days prior to the inspection need (e.g., two working days - 10:00 a.m. Tuesday request for a 10:00 a.m. Thursday inspection, excluding holidays and weekends).

If, after proper written request, the department fails to make an electrical inspection at the time requested, underground conduit may be covered after inspection by the local government jurisdiction's project inspector/designee. Written documentation of a local government jurisdiction inspection must be provided to the department when requested. Written documentation will include:

- (i) Date of inspection.
- (ii) Location.
- (iii) Installing firm.
- (iv) Owner.
- (v) Type of conduit.
- (vi) Size of conduit.
- (vii) Depth of conduit.
- (viii) Project inspector/designee name.

(7) Identification of traffic management system components. Local government jurisdictions or WSDOT may act as the certifying authority for the safety evaluation of components.

(a) An electrical service cabinet must contain only listed components. The electrical service cabinet enclosure is not required to be listed but will conform to subsection (2) of this section.

(b) The local government jurisdiction must identify, as acceptable, the controller cabinet with an identification plate. The identification plate must be located inside the cabinet and may be attached with adhesive.

(8) Conductors of different circuits in same cable, enclosure, or raceway.

All traffic management system circuits will be permitted to occupy the same cable, enclosure, or raceway without regard to voltage characteristics, provided all conductors are insulated for the maximum voltage of any conductor in the cable, enclosure, or raceway.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238 and chapter 19.28 RCW. 01-01-097, § 296-46A-104, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-110 Identification methods. (1) Each cable operating at over 600v and installed on customer owned systems must be legibly marked in a permanent manner at each termination point and at each point the cable is accessible. The required marking must use phase designation, operating voltage, and circuit number if applicable.

(2) Where electrical equipment is installed to obtain a series combination rating, the identification as required by Article 110-22 NEC, must be in the form of an identification plate that is substantially yellow in color. The words "CAUTION - SERIES RATED SYSTEM" must be on the label in letters at least 1/2" (13mm) high.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-110, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-130 Classification or definition of occupancies. Occupancies are classified and defined by the agency that registers or licenses or defines their operation or occupancy, as follows:

(1) Educational facility refers to a building or portion of a building used primarily for educational purposes by six or more persons at one time for twelve hours per week or four hours in any one day. Educational occupancy includes: Schools (preschool through grade 12), colleges, academies, universities, and trade schools.

(2) Institutional facility refers to a building or portion of a building used primarily for detention and correctional occupancies where some degree of restraint or security is required. Such occupancies include, but are not restricted to: Penal institutions, reformatories, jails, detention centers, correctional centers, and residential-restrained care.

(3) Health or personal care facility. Health or personal care facility refers to buildings or parts of buildings that contain, but are not limited to, facilities that are required to be licensed by the department of social and health services (e.g., hospitals, nursing homes, private alcoholism hospitals, private psychiatric hospitals, boarding homes, alcoholism treatment facilities, maternity homes, birth centers or childbirth centers, residential treatment facilities for psychiatrically impaired children and youths, and renal hemodialysis clinics) and medical, dental or chiropractic offices or clinics, outpatient or ambulatory surgical clinics, and such other health

care occupancies where patients who may be unable to provide for their own needs and safety without the assistance of another person are treated.

(a) "Hospital" means any institution, place, building, or agency providing accommodations, facilities and services over a continuous period of twenty-four hours or more, for observation, diagnosis, or care of two or more individuals not related to the operator who are suffering from illness, injury, deformity, or abnormality, or from any other condition for which obstetrical, medical, or surgical services would be appropriate for care or diagnosis.

(b) "Nursing home unit" or "long-term care unit" means a group of beds for the accommodation of patients who, because of chronic illness or physical infirmities require skilled nursing care and related medical services but are not acutely ill and not in need of the highly technical or specialized services ordinarily a part of hospital care.

(c) "Boarding home" means any home or other institution, however named, which is advertised, announced, or maintained for the express or implied purpose of providing board and domiciliary care to three or more aged persons not related by blood or marriage to the operator. It must not include any home, institution, or section thereof which is otherwise licensed and regulated under the provisions of state law providing specifically for the licensing and regulation of such home, institution, or section thereof.

(d) "Private alcoholism hospital" means an institution, facility, building, or equivalent designed, organized, maintained, and operated to provide diagnosis, treatment, and care of individuals demonstrating signs or symptoms of alcoholism, including the complications of associated substance use and other medical diseases that can be appropriately treated and cared for in the facility and providing accommodations, medical services, and other necessary services over a continuous period of twenty-four hours or more for two or more individuals unrelated to the operator, provided that this chapter will not apply to any facility, agency, or other entity which is owned and operated by a public or governmental body.

(e) "Alcoholism treatment facility" means a private place or establishment, other than a licensed hospital, operated primarily for the treatment of alcoholism.

(f) "Private psychiatric hospital" means a privately owned and operated establishment or institution which: Provides accommodations and services over a continuous period of twenty-four hours or more: And is expressly and exclusively for observing, diagnosing, or caring for two or more individuals with signs or symptoms of mental illness, who are not related to the licensee.

(g) "Maternity home" means any home, place, hospital, or institution in which facilities are maintained for the care of four or more women, not related by blood or marriage to the operator, during pregnancy or during or within ten days after delivery: Provided, however, That this definition will not apply to any hospital approved by the American College of Surgeons, American Osteopathic Association or its successor.

(h) "Birth center" or "childbirth center" means a type of maternity home which is a house, building, or equivalent organized to provide facilities and staff to support a birth ser-

vice, provided that the birth service is limited to low-risk maternal clients during the intrapartum period.

(i) "Ambulatory surgical facility" means a facility, not a part of a hospital, providing surgical treatment to patients not requiring inpatient care in a hospital. This term does not include a facility in the offices of private physicians or dentists, whether for individual or group practice, if the privilege of using such facility is not extended to physicians or dentists outside the individual or group practice. (NEC; Ambulatory Health Care Center.)

(j) "Hospice care center" means any building, facility, place, or equivalent, organized, maintained, and operated specifically to provide beds, accommodations, facilities, and services over a continuous period of twenty-four hours or more for palliative care of two or more individuals, not related to the operator, who are diagnosed as being in the latter stages of an advanced disease which is expected to lead to death.

(k) "Renal hemodialysis clinic" is a facility in a building or part of a building which is approved to furnish the full spectrum of diagnostic, therapeutic, and rehabilitative services required for the care of renal dialysis patients (including inpatient dialysis furnished directly or under arrangement). (NEC; Ambulatory Health Care Center.)

(l) "Medical, dental, and chiropractic clinic" means any clinic or physicians' office where patients are not regularly kept as bed patients for twenty-four hours or more. Electrical plan review not required.

(m) "Residential treatment facility for psychiatrically impaired children and youth" means a residence, place, or facility designed and organized to provide twenty-four hour residential care and long-term individualized, active treatment for clients who have been diagnosed or evaluated as psychiatrically impaired.

(n) "Adult residential rehabilitation center" means a residence, place, or facility designed and organized primarily to provide twenty-four hour residential care, crisis and short-term care and/or long-term individualized active treatment and rehabilitation for clients diagnosed or evaluated as psychiatrically impaired or chronically mentally ill as defined herein or in chapter 71.24 RCW.

(o) "Group care facility" means a facility other than a foster-family home maintained and operated for the care of a group of children on a twenty-four-hour basis.

(4) Licensed day care centers.

(a) "Child day care center" means a facility providing regularly scheduled care for a group of children one month of age through twelve years of age for periods less than twenty-four hours; except, a program meeting the definition of a family child care home will not be licensed as a day care center without meeting the requirements of WAC 388-150-020 (5)(a).

(b) "School-age child care center" means a program operating in a facility other than a private residence accountable for school-age children when school is not in session. It must meet department licensing requirements, provide adult supervised care, and a variety of developmentally appropriate activities.

(c) "Family child day care home" means the same as "family child care home" and "a child day care facility"

licensed by the state, located in the family abode of the person or persons under whose direct care and supervision the child is placed, for the care of twelve or fewer children, including children who reside at the home. Electrical plan review not required.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-130, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-140 Plan review for educational, institutional or health care facilities and other buildings.

(1) Plan review is a part of the electrical inspection process; its primary purpose is to determine that loads are calculated per the proper NEC or WAC article or section and that conductors and equipment are adequately sized and rated to the calculated load.

(2) All electrical plans for new or altered electrical installations in educational, institutional, and health or personal care occupancies classified or defined in this chapter must be reviewed and approved before the electrical installation or alteration is begun.

(3) All electrical plans for educational, hospital and nursing home occupancies must be prepared by, or under the direction of, a consulting electrical engineer registered under chapter 18.43 RCW, and chapters 246A-320, 180-29, and 388-97 WAC and stamped with the engineer's mark and signature.

(4) Plans for these electrical installations within cities that perform electrical inspections within their jurisdiction, and provide an electrical plan review program that equals or exceeds the department's program in plans examiner minimum qualifications per chapter 19.28 RCW, must be submitted to that city for review rather than to the department, unless the agency licensing or regulating the installation specifically requires review by the department.

(5) Refer plans for department review to the Electrical Inspection Section, Department of Labor and Industries, P.O. Box 44460, Olympia, Washington 98504-4460.

(6) Approved plans must be available on the job site for use during the electrical installation or alteration and for use by the electrical inspector.

(7) Plans to be reviewed by the department must be legible, identify the name and classification of the facility, clearly indicate the scope and nature of the installation and the person or firm responsible for the electrical plans. The plans must clearly show the electrical installation or alteration in floor plan view, include switchboard and/or panelboard schedules and when a service or feeder is to be installed or altered, must include a riser diagram, load calculation, fault current calculation and interrupting rating of equipment. Where existing electrical systems are to supply additional loads, the plans must include documentation that proves adequate capacity and ratings. The plans must be submitted with a plan review submittal form available from the department. All required fees will be paid after the review is completed. Approved plans will be returned when all fees are paid.

(2001 Ed.)

(8) Plan review for new or altered electrical installations of other types of construction may be voluntarily requested by the owner or electrical contractor.

(9) For existing structures where additions or alterations to feeders and services are proposed, Article 220-35(1) NEC may be used. If Article 220-35(1) NEC is used, the following is required:

(a) The date of the measurements.

(b) A statement attesting to the validity of the demand data, signed by a professional electrical engineer or the electrical administrator of the electrical contractor performing the work.

(c) A diagram of the electrical system identifying the point(s) of measurement.

(d) Building demand measured continuously on the highest-loaded phase of the feeder or service over a thirty-day period, with demand peak clearly identified. (Demand peak is defined as the maximum average demand over a fifteen-minute interval.)

(10) Due to their minimal load requirements, plan review of the following limited energy systems will not be required: Fire alarm, nurse call, intrusion or security alarm, intercom, public address, music, energy management, programmed clock, or telecommunications.

(11) When the service or feeder load calculation is affected five percent or less by the addition or alteration of five or less branch circuits, plan review for the branch circuits may be requested from the department's local inspection office. Permission for such small project plan review may be granted at the discretion of the electrical inspection field supervisor, the plans examiner supervisor, or the chief electrical inspector.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-140, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-155 Wiring methods for designated building occupancies. Wiring methods, equipment and devices for health or personal care, educational and institutional facilities as defined or classified in this chapter and for places of assembly for one hundred or more persons must comply with Tables 1 and 2 and the notes thereto. For determining the occupant load of places of assembly, the methods of the currently adopted edition of the Uniform Building Code must be used.

Table 1
Health or Personal Care Facilities
Electrical System - Wiring Methods

Health or Personal Care Facility Type	Power and Lighting	Emergency Power and Lighting	Limited Energy Systems	Patient Care Areas	Plan Review
Hospital	1	1	1	1	YES
Nursing home unit or long-term care unit	1	1	1	1	YES
Boarding home or assisted living facility	1	1	1		YES
Private alcoholism hospital	1	1	1	1	YES

[Title 296 WAC—p. 1129]

Health or Personal Care Facility Type	Power and Lighting	Emergency Power and Lighting	Limited Energy Systems	Patient Care Areas	Plan Review
Alcoholism treatment facility	1	1	1		YES
Private psychiatric hospital	1	1	1	1	YES
Maternity home	1	1	1	1	YES
Birth center or childbirth center	1	1	1	1	NO
Ambulatory surgery facility	1	1	1	1	YES
Hospice care center	1		1		NO
Renal hemodialysis clinic	1	1	1	1	YES
Medical, dental, and chiropractic clinic	1	1	1	1	NO
Residential treatment facility for psychiatrically impaired children and youth	1	1	1	1	YES
Adult residential rehabilitation center	1	1	1		YES
Group care facility	1	1	1		NO

Table 2
Educational and Institutional Facilities,
Places of Assembly or Other Facilities
Electrical System - Wiring Methods

Educational, Institutional or Other Facility Type	Power and Lighting	Emergency Power and Lighting	Limited Energy Systems	Plan Review
Educational	2	2	1	YES
Institutional	2	2	1	YES
Places of assembly for 100 or more persons	1	1	1	NO
Child day care center	1	1	1	NO
School-age child care center	1	1	1	NO
Family child day care home, family child care home, or child day care facility	1	1	1	NO

Notes to Tables 1 and 2

1. Wiring methods in accordance with the NEC.
2. Metallic or nonmetallic raceways, MI, MC, or AC cable.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-155, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-21052 Tamper resistant receptacles.

Listed tamper resistant receptacles or listed tamper resistant cover plates are required in licensed day care facilities, pediatric, or psychiatric patient care areas for 15 or 20 ampere, 125 volt receptacles.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-21052, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-215 Feeders—Ground fault protection testing. Equipment ground fault protection systems required by the NEC must be tested prior to being placed into service to verify proper installation and operation of the system as determined by the manufacturer's published instructions. This test or a subsequent test must include all system feeders. The test must be performed by a firm that has qualified personnel and proper equipment to perform the tests required. A copy of the manufacturer's performance testing instructions and a written performance acceptance test record signed by the person performing the test must be provided for the inspector's records at the time of inspection. The performance acceptance test record must include test details including, but not limited to: All trip settings and measurements taken during the test.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-215, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-220 Branch circuit and feeder calculations. (1) Circuits must be taken to all unfinished spaces adaptable to future dwelling unit living areas which are not readily accessible to the service or branch circuit panelboard. The circuits must terminate in a suitable box(es). The box must contain an identification of the intended purpose of the circuit(s). The branch circuit panelboard must have adequate space and capacity for the intended load(s).

(2) Occupancy lighting loads. In determining feeder and service entrance conductor sizes and equipment ratings, the currently adopted Washington state energy code unit lighting power allowance table and footnotes may be used in lieu of 220-3 NEC.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-220, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-22530 More than one building or other structure. The building disconnecting means required by Article 225-32 NEC (except for Exceptions 1, 2, 3, or 4), must be provided to disconnect all ungrounded conductors that supply or pass through a building or structure per the requirements of NEC 225-32 (except for Exceptions 1, 2, 3, or 4) in accordance with subsection (1) or (2) of this section.

(1) Outside feeder: Where the feeder disconnecting means is installed outside a building or structure it must be on the building or structure or within sight and within fifteen feet of the building or structure supplied. The building disconnecting means may supply only one building/structure unless the secondary building(s)/structure(s) has a separate building disconnecting means meeting the requirements of the NEC and this subsection. The disconnecting means must have an identification plate with 1/2" high letters identifying:

- (a) The building/structure served;
- (b) Its function as the building/structure main disconnect(s).

(2) Inside: The feeder disconnecting means may be installed anywhere inside a building or structure when there is a feeder disconnecting means, located elsewhere on the

premises, with overcurrent protection sized for the feeder conductors.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-22530, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-23001 Service requirements. (1) The serving utility must be consulted by the owner, the owner's agent, or the contractor making the installation regarding the service entrance location and meter equipment requirements before installing the service and equipment. Provisions for a meter and related equipment, an attachment of a service drop, or an underground service lateral must be made at a location acceptable to the serving utility. The point of contact for a service drop must permit the clearances required by the NEC.

(2) A fire wall must have a minimum two-hour rating as defined by the Uniform Building Code to be considered a building separation in accordance with Article 100 NEC. Buildings of more than one-hour fire-rated construction must have a fire wall separation in compliance with the Uniform Building Code.

(3) The height of the center of the service meter must be as required by the serving utility. Secondary instrument transformer metering conductor(s) are not permitted in the service raceway.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-23001, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-23028 Service or other masts. Conduit extended through the roof to provide means of attaching:

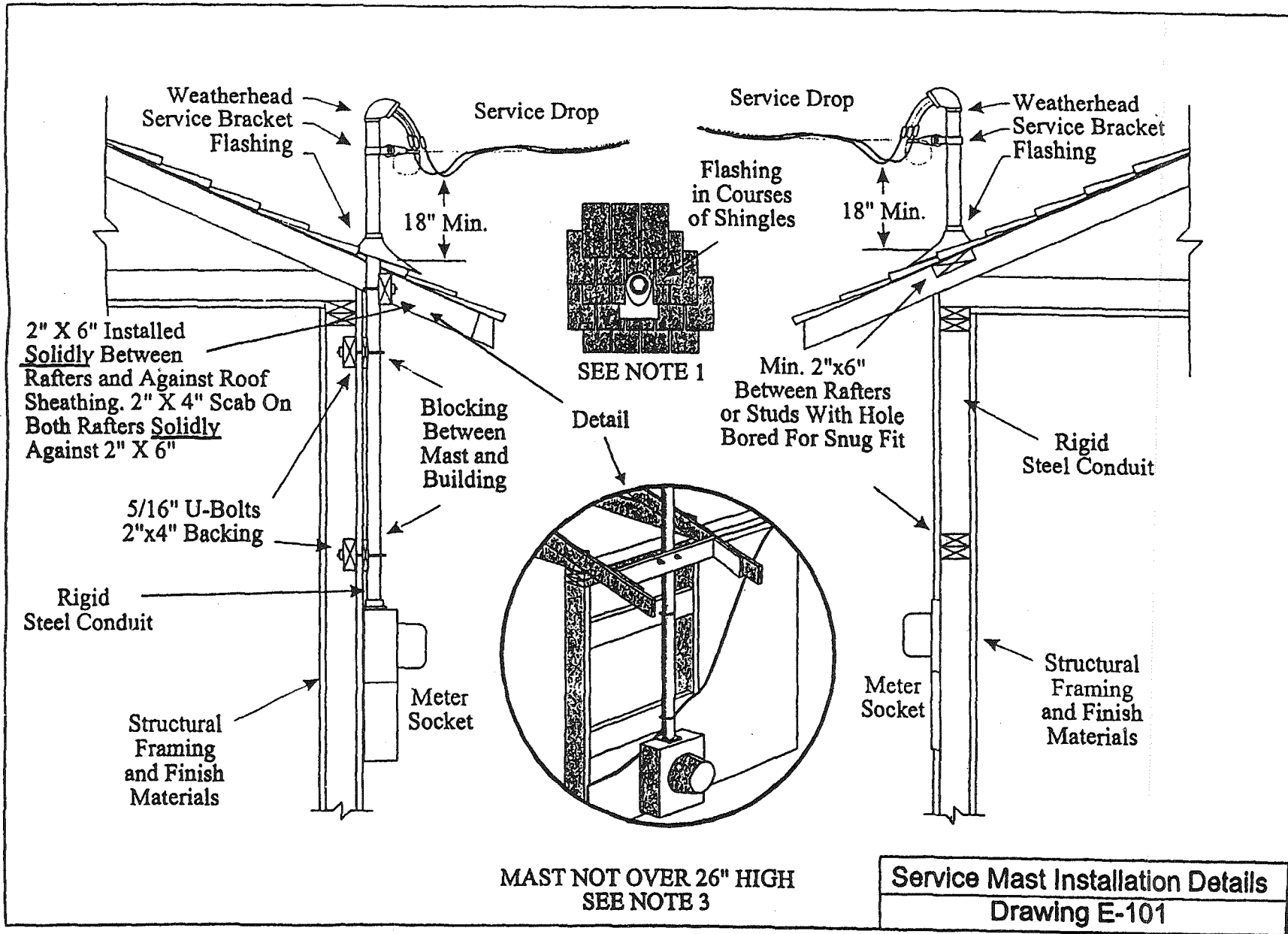
(1) All overhead drops for service, feeder, or branch circuits exceeding #1 aluminum or #3 copper must be rigid steel galvanized conduit no smaller than 2-inch.

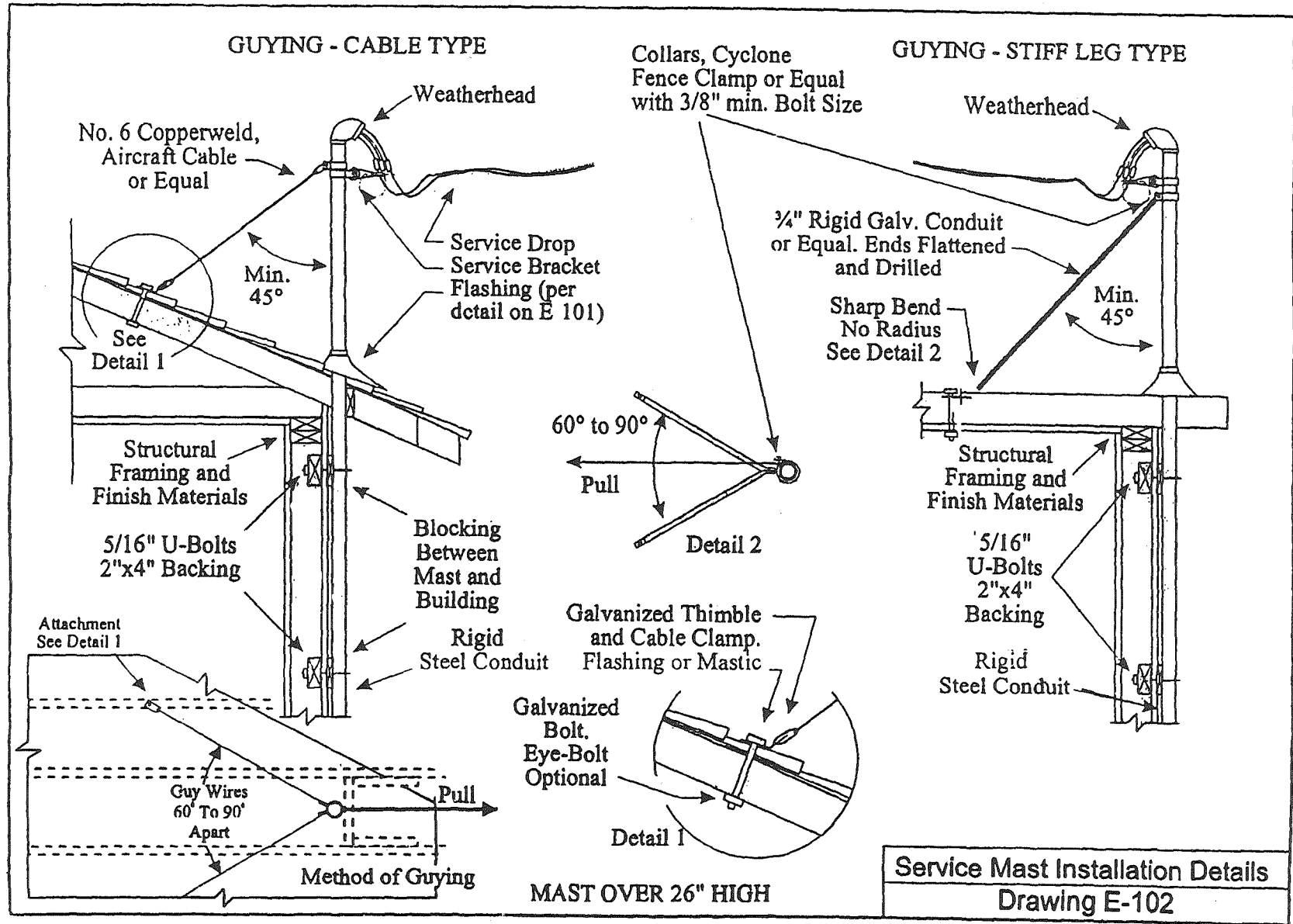
(2) All overhead drops for service, feeder or branch circuits not exceeding #1 aluminum or #3 copper must be rigid steel galvanized conduit no smaller than 1 1/4-inch.

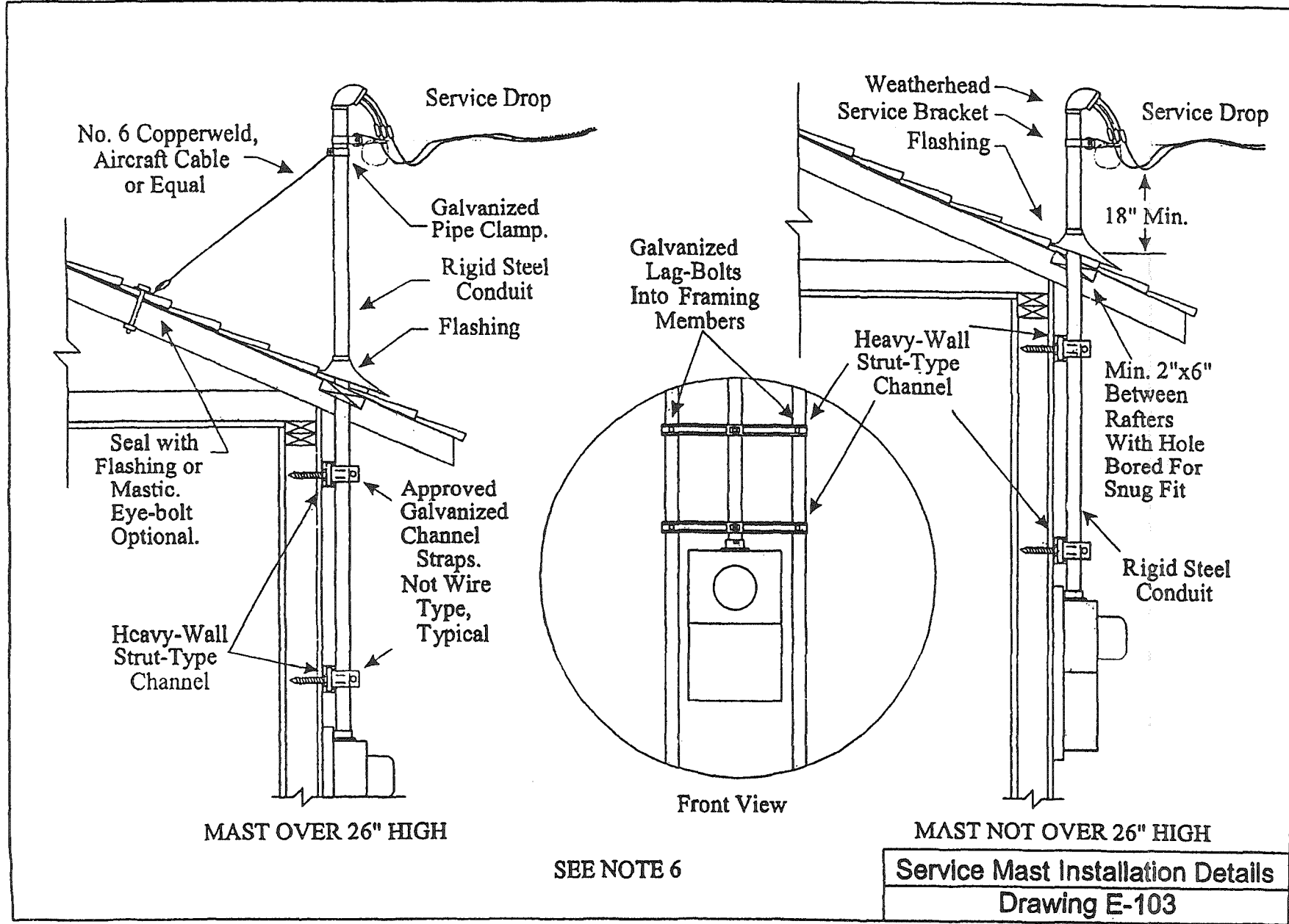
The installation must comply with drawings E-101 and/or E-102, or must provide equivalent strength by other approved means. Masts for altered or relocated installations will be permitted to comply with drawing E-103.

Notes to drawings E-101, E-102, and E-103.

1. An approved roof flashing must be installed on each mast where it passes through a roof. Plastic, nonhardening mastic must be placed between lead-type flashings and the conduit. Neoprene type flashings will also be permitted to be used.
2. Masts must be braced, secured, and supported in such a manner that no pressure from the attached conductors will be exerted on a roof flashing, meter base, or other enclosures.
3. Utilization of couplings for a mast are permitted only below the point the mast is braced, secured, or supported.
4. Except as otherwise required by the serving utility, service mast support guys must be installed if the service drop attaches to the mast more than 24 inches above the roof line or if the service drop is greater than 100 feet in length from the pole or support. Masts for support of other than service drops must comply with this requirement as well.
5. Intermediate support masts must be installed in an approved manner with methods identical or equal to those required for service masts.
6. For altered services, where it is impractical to install U bolt mast supports due to interior walls remaining closed, it will be permissible to use other alternate mast support methods such as heavy gauge, galvanized, electrical channel material that is secured to two or more wooden studs with 5/16-inch diameter or larger galvanized lag bolts.







SEE NOTE 6

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW .01-01-097, § 296-46A-23028, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-23040 Service conductors. (1) Service entrance conductors must extend at least eighteen inches from the service head to permit connection to the service drop.

(2) Installation of service conductors.

(a) The installation of service conductors not exceeding 600 volts, nominal, within a building or structure is limited to the following methods: Galvanized or aluminum rigid metal conduit; galvanized intermediate metal conduit; wireways; busways; auxiliary gutters; rigid nonmetallic conduit; cablebus; or mineral-insulated, metal-sheathed cable (type MI).

(b) The installation of service conductors exceeding 600 volts, nominal, within a building or structure must be limited to the following methods: Galvanized rigid metal conduit; galvanized intermediate metal conduit; metal-clad cable that is exposed for its entire length; cablebus; or busways.

(c) In addition to methods allowed in the NEC, the grounded service conductor is permitted to be identified with a yellow jacket or with one or more yellow stripes.

(3) Service conductors under the control of the utility, where installed within a building or structure, must be installed in rigid steel galvanized conduit or Schedule 80 nonmetallic conduit.

(4) Multiple-occupancy buildings. A second or additional service drop or lateral to a building having more than one occupancy will be permitted to be installed at a location separate from other service drops or laterals to the building provided that all the following conditions are complied with:

(a) Each service drop or lateral is sized in accordance with the NEC for the calculated load to be served by the conductors;

(b) Each service drop or lateral terminates in listed metering/service equipment that is located in or on a unit served by the service equipment. Each occupant must have access to the occupant's service disconnecting means;

(c) The service drops or laterals originate at the same transformer or power supply;

(d) The service equipment is separated at least fifteen feet from other service equipment in or on the building; and

(e) A permanent label is placed at each service equipment location that identifies all other service equipment locations in or on the building and the area or units served by each.

EXCEPTION: Service drops and laterals for two-family dwellings may terminate in meter enclosures located less than fifteen feet apart.

(5) The service disconnecting means must be installed at a readily accessible location in accordance with (a) or (b) of this subsection.

(a) Outside: Service disconnecting means will be permitted on the building or structure or within sight and within fifteen feet of the building or structure served. The building disconnecting means may supply only one building/structure. The service disconnecting means must have an identification plate with 1/2" high letters identifying:

(i) The building/structure served;

(ii) Its function as the building/structure main service disconnect(s).

(b) Inside: When the service disconnecting means is installed inside the building or structure, it must be located so

that the service raceway extends no more than fifteen feet inside the building/structure.

(6) If the service conductors have a lesser ampacity than the overcurrent protection or the equipment rating that they terminate in or on, an identification plate with the ampacity of the conductors must be installed on the equipment.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-23040, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-23062 Service equipment. (1) Service equipment, subpanels, and similar electrical equipment must be installed so that they are readily accessible and may not be installed in bathrooms, clothes closets, or shower rooms. All indoor service equipment and subpanel equipment must have adequate working space and be adequately illuminated.

(2) Temporary construction service equipment may only be used for construction purposes and must be disconnected when the permanent service is connected unless an extension for a definite period of time is granted by the department.

(3) Equipment ground fault protection systems required by the NEC must be tested prior to being placed into service to verify proper installation and operation of the system as determined by the manufacturer's published instructions. This test or a subsequent test must include all service voltage feeders. The test must be performed by a firm that has qualified personnel and proper equipment to perform the tests required. A copy of the manufacturer's performance testing instructions and a written performance acceptance test record signed by the person performing the test must be provided for the inspector's records at the time of inspection. The performance acceptance test record must include test details including, but not limited to: All trip settings and measurements taken during the test.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-23062, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-250 Grounding and bonding. (1) Metallic stubs or valves used in nonmetallic plumbing systems are not required to be grounded or bonded to the electrical system unless required by an electrical equipment manufacturer's instructions.

(2) Hot and cold water plumbing lines are not required to be bonded together if, at the time of inspection, the inspector can determine the lines are mechanically and electrically joined by one or more metallic mixing valves.

(3) A temporary construction service is permitted to have only one made electrode.

(4) If a ground resistance test is not performed to ensure a resistance to ground of 25 ohms or less, two or more electrodes as specified in Article 250-52 NEC must be installed a minimum of six feet apart.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-250, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-300 Wiring methods. Cables and raceways for telecommunications, NEC Class 2 and Class 3 conductors must be installed in compliance with Chapter 3 NEC unless other methods are specifically allowed elsewhere in the NEC, chapter 19.28 RCW, or this chapter.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-300, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-30011 Support of raceways, cables, or boxes in suspended ceilings. (1) NEC Class 2, and Class 3 cables must be secured in compliance with Article 336-18 NEC and must be secured to boxes in compliance with Article 370-17 NEC.

(2) Telecommunications cables must be secured in a manner that will not cause damage to the cables and at intervals not exceeding five feet. Cables are considered adequately supported when run through holes in building structural elements or other supporting elements. Telecommunications cables may be fished into inaccessible hollow spaces of finished buildings. Clamps or fittings are not required where telecommunications cables enter boxes.

(3) Optical fiber cables must be secured in a manner that will not cause damage to the cables and at intervals not exceeding five feet. Cables are considered adequately supported when run through holes in building structural elements or other supporting elements. Optical fiber cables may be fished into inaccessible hollow spaces of finished buildings. Supports must allow a bending radius that will not cause damage to the cables.

(4) The wires required in Article 300-11(a) NEC may support raceways, cables, or boxes under the following conditions:

(a) Raceways and/or cables are not larger than 3/4-inch trade size.

(b) No more than two raceways or cables are supported by a support wire. The two-cable limitation does not apply to telecommunications cables, Class 2 cables, or Class 3 cables on support wires installed exclusively for telecommunications cables, Class 2 cables, or Class 3 cables and secured with fittings adequate to carry the cable weight.

(c) Raceways and cables are secured to the support wires by fittings designed and manufactured for the purpose.

(d) The support wires are minimum Number 12 gauge and are securely fastened to the structural ceiling and to the ceiling grid system.

(e) The raceways or cables serve equipment that is located within the ceiling cavity or is mounted on or supported by the ceiling grid system. Telecommunications cables, Class 2 cables, or Class 3 cables supported as required by this section, may pass through ceiling cavities without serving equipment mounted on or supported by the ceiling grid system.

(f) Where not restricted by the building code official or Article 300 NEC.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-30011, filed 12/15/00, effective 1/18/01.]

[Title 296 WAC—p. 1136]

WAC 296-46A-324 Knob-and-tube wiring. Article 324 NEC does not prohibit the installation of loose or rolled thermal insulating material in spaces containing existing knob-and-tube wiring provided that all the following conditions are met:

(1) The wiring must be surveyed by an appropriately licensed electrical contractor who must certify that the wiring is in good condition with no evidence of improper overcurrent protection, conductor insulation failure or deterioration, and with no improper connections or splices. All repairs, alterations, or extensions to the electrical system must be inspected by an electrical inspector as defined in chapter 19.28 RCW.

(2) The insulation must meet Class I specifications as identified in the Uniform Building Code, with a flame spread factor of twenty-five or less as tested using ASTM E84-81a. Foam insulation may not be used with knob-and-tube wiring.

(3) All knob-and-tube circuits must have overcurrent protection in compliance with the 60 degree C column of Table 310-16 of the NEC. Overcurrent protection must be either circuit breakers or Type S fuses.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-324, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-348 Electrical metallic tubing. (1) In addition to complying with the provisions of Article 348 NEC, electrical metallic tubing may not be installed in direct contact with the earth or in concrete on or below grade. See also Article 300-6 NEC.

(2) Electrical metallic tubing must not be installed as the wiring method for service entrance conductors inside a building. Existing electrical metallic tubing, installed prior to October 1984, which is properly grounded and used for service entrance conductors may be permitted to remain if the conduit is installed in a nonaccessible location and of the proper size for the installed conductors.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-348, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-365 Concerts, motion picture productions, stage shows, and similar shows. (1) Service equipment, separately derived systems, feeders and circuits for concerts, motion picture productions, stage shows, and similar shows, must comply with the NEC and this chapter.

(2) The ampacity of cords and cables must be determined from the appropriate Article 400 NEC cord and cable ampacity tables including all notes.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-365, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-370 Boxes and fittings. Single conductors, cables, taps, or splices installed in an open bottom junction box or handhole must be suitable for direct burial. However, an open bottom box manufactured specifically for electrical use will be permitted to be used as an electrical junction

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box to enclose single conductors, cables, taps, or splices rated for wet locations, only under the following conditions:

(1) In vehicular traffic areas the box must be rated for not less than H-20 loading and be provided with a bolted, hinged, or slide-on lid embossed with the identification "ELECTRIC" or "ELECTRICAL."

(2) In incidental vehicular traffic areas (e.g., parks, sports fields, sidewalks, grass lawns, etc.) the box must be rated for not less than H-10 loading and be provided with a bolted, hinged, or slide-on lid embossed with the identification "ELECTRIC" or "ELECTRICAL."

(3) In nonvehicular traffic areas (e.g., flower beds, patio decks, etc.) the box must be designed for the purpose and be provided with a lid embossed with the identification "ELECTRIC" or "ELECTRICAL."

(4) All conductors must be installed in approved electrical raceways that enter vertically from the open bottom of the enclosure. These raceways must be fitted with a bushing, terminal fitting, or seal incorporating the physical protection characteristics of a bushing, and project not less than two inches (5 cm) above the bottom surface material. The bottom surface material must be pea gravel or sand a minimum of two inches (5 cm) thick or more if required by the box manufacturer.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-370, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-41004 Lighting fixtures. All lighting fixtures within an enclosed shower area or within five feet of the waterline of a bathtub must be totally enclosed.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-41004, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-41030 Flexible cord connection pendant boxes and electric discharge fixtures. (1) The flexible cord connection must comply with Article 410-30 NEC.

(2) Connection to a suspended pendant box must utilize an integral threaded hub.

(3) The length of the cord for a suspended pendant drop from a permanently installed junction box to a suitable tension take-up device must not exceed six feet.

(4) Flexible cord used to connect electric discharge fixtures must comply with Article 410-30 NEC.

(5) The flexible cord must be supported at each end with an approved cord grip or strain relief connector fitting/device that will eliminate all stress on the conductor connections.

(6) The flexible cord must be a minimum number 14 AWG.

(7) The flexible cord ampacity must be determined in Table 400-5(A) column A NEC.

(8) The flexible cord must be hard or extra hard usage.

(9) A vertical flexible cord supplying electric discharge fixtures must be secured to the fixture support as per Article 336-18 NEC.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c (2001 Ed.)

238, and chapter 19.28 RCW. 01-01-097, § 296-46A-41030, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-422 Water heater circuit. Water heaters which have a rated circuit load in excess of 3,500 watts at 240 volts must be provided with branch circuit conductors not smaller than No. 10 AWG copper or equal.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-422, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-450 Transformers. (1) Transformers not under the control of a utility, with a primary voltage greater than 600 volts must be provided with a disconnecting means meeting the requirements of Article 230-205 NEC.

(2) Flammable-liquid or oil filled transformers installed outdoors must meet the following requirements:

(a) A transformer installed adjacent to a combustible building/structure with any combustible surface may be located only in the shaded "Approved Transformer Area" shown in Figure 450-1;

(b) A transformer installed adjacent to a building/structure with no combustible surface(s) may be located only in the shaded "Approved Transformer Area" shown in Figure 450-2;

(c) In an urban residential area that has an improved alleyway, and in which a transformer is to be installed next to a noninhabited structure, the transformer may be no closer than two feet to the building/structure and must be outside a line extended vertically from the ends of the eaves or roof lines;

(d) A building/structure may have no doors, windows, stairways, or other openings closer than eight feet to the transformer;

(e) The finished grade at the location of the transformer must be such that any oil leaking from the transformer will flow away from the building/structure and will not pool; and

(f) If transformers are installed in areas subject to traffic other than pedestrian traffic, they must be provided with adequate guarding.

(3) Enclosures for total underground flammable-liquid or oil filled transformers must not be located within eight feet of a doorway, operable window, stairways or fire escape. Adequate space must be maintained above the enclosure so that a boom may be used to lift the transformer from the enclosure.

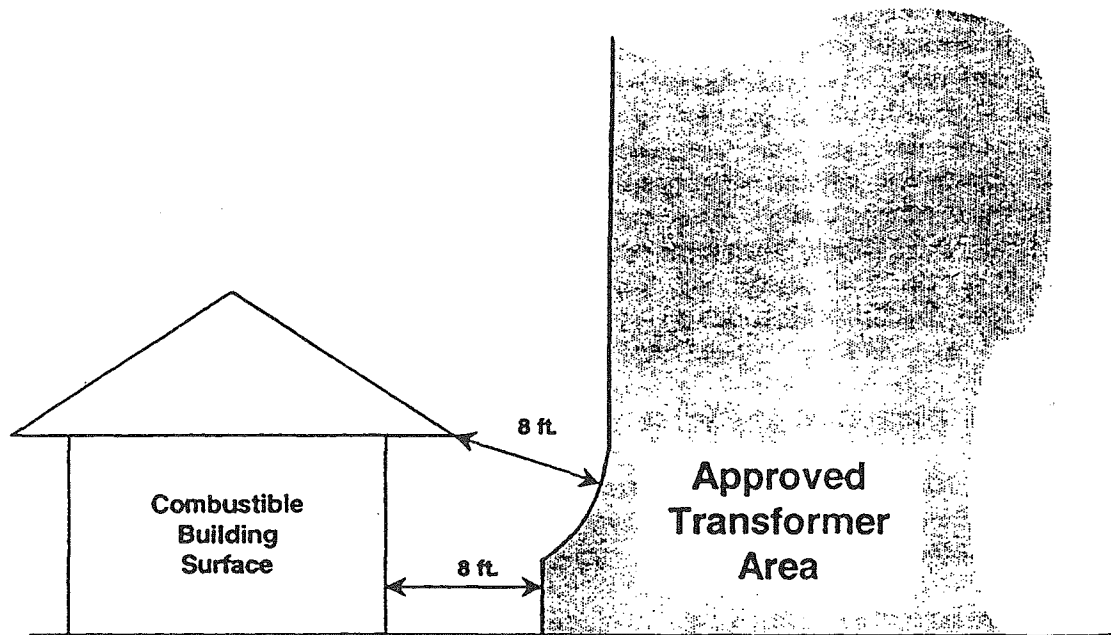


Figure 450-1

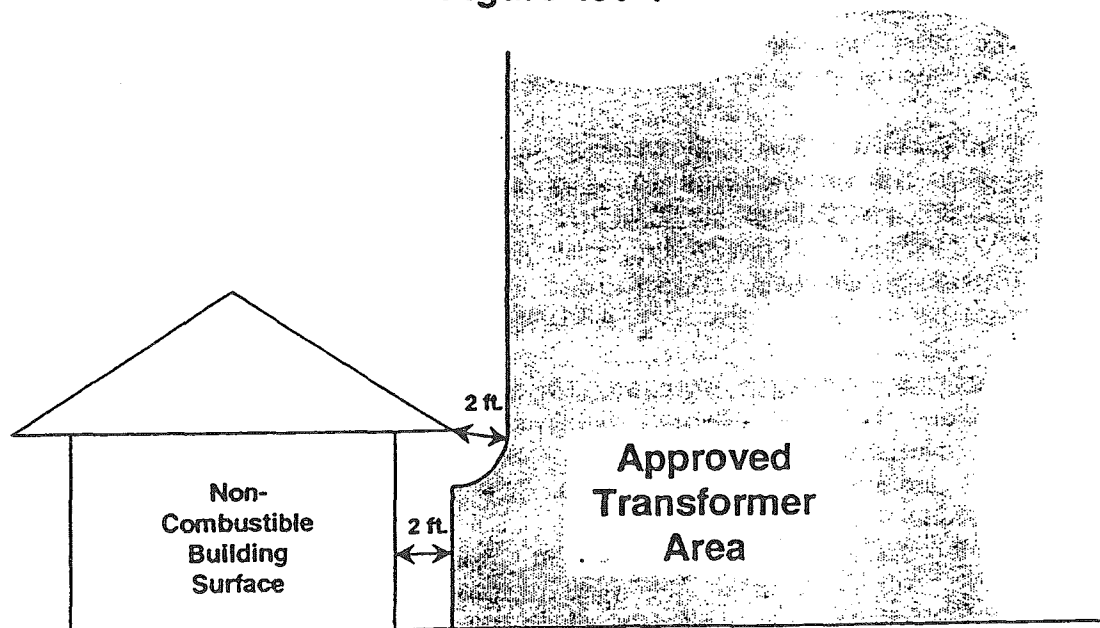


Figure 450-2

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-450, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-500 Sewage disposal systems. (1) Pumping chambers for sewage, effluent, or grinder pumps in on-site and septic tank effluent pump (S.T.E.P.) disposal systems will be considered unclassified when not more than five residential units are connected to the system, residential units are connected to a utility sewage system, or when nonresidential systems have residential loading characteristics and all of the following general installations requirements are complied with.

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(a) The pumping chamber must be adequately vented. Venting may be accomplished through the building or structure plumbing vents where the system venting has been approved by the local jurisdiction authority or by a direct two-inch minimum vent to the atmosphere.

(b) Equipment that in normal operation may cause an arc or spark must not be installed in any pumping chamber.

(c) Float switches installed in a pumping chamber must be hermetically sealed to prevent the entrance of gases or vapors.

(d) Junction boxes, conduits and fittings installed in the septic atmosphere must be of a noncorrosive type, installed to prevent the entrance of gases or vapors.

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(e) Where a conduit system is installed between the pumping chamber and the control panel, motor disconnect, or power source, an approved sealing method must be installed to prevent the migration of gases or vapors from the pumping chamber, and must remain accessible.

(f) Wire splices in junction boxes installed in pumping chambers, must be suitable for wet locations.

(2) Nonresidential loading characteristics must be certified by a Washington state registered professional engineer, engaged in the business of wastewater management systems design. Documentation that is signed and stamped by the engineer must be provided to the electrical inspector prior to the inspection.

(3) Any residential or nonresidential system that has building or structure floor drains being discharged into the system is classified as Class I Division I. Drains from any commercially made tub, shower, basin, sink, or toilet are not considered floor drains.

(4) Pumping chamber access covers are permitted to be covered by gravel, light aggregate, or noncohesive granulated soil, and must be accessible for excavation. Access covers that are buried, must have their exact location identified at the electrical panel or other prominent location approved by the authority having jurisdiction.

(5) Indoor grinder pumps installed in chambers with less than fifty gallons capacity are not required to meet the requirements of this section, except for the venting requirements in subsection (1)(a) of this section. Indoor grinder pumps installed in chambers with less than fifty gallons capacity are not classified systems as described in Article 500 NEC.

(6) Secondary treatment effluent pumping chambers such as sand filters are unclassified, and require no special wiring methods.

(7) Inspection approval is required prior to covering or concealing any portion of the septic electrical system, including the pump. New septic and effluent tanks containing electrical wires and equipment must be inspected and approved by the department prior to being loaded with sewage.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-500, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-514 Dispensing and service stations.

(1) An emergency disconnecting means or operator must be provided to disconnect the pump or dispensing equipment serving gasoline, volatile flammable liquids, or liquefied flammable gases. The emergency disconnecting means or operator must disconnect all conductors of the circuit supplying all station dispensers and/or pumps (including the grounded conductor) simultaneously from the source(s) of supply.

(2) For installations with only one dispensing device, the emergency disconnecting means/operator may be used to satisfy subsection (1) of this section.

(3) For multicircuit installations an electrically held normally open contactor operated by a push-button is permitted to be used as the disconnecting means to satisfy subsection (1) of this section.

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(4) The disconnecting means satisfying subsection (1) of this section must be labeled with an identification plate, with letters at least one inch high, as the emergency disconnecting means. The disconnecting means or operator must be:

(a) Substantially red in color; and

(b) Readily accessible and must be located outdoors and within sight of the pump or dispensing equipment it controls.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-514, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-517 Health care facilities. In health care facilities, the following methods must be used to determine adequate capacity and ratings of equipment providing electrical power for the essential electrical systems defined in Article 517 NEC:

(1) Systems in new facilities:

(a) Emergency system: The emergency branch must consist of two branches known as:

(i) Life safety system: The feeder conductors and equipment used to supply electrical power to the life safety branch must be determined by summation of the connected loads as determined by Article 220 NEC and may not be subjected to any reduction due to the diversity of the loads. Feeder and equipment will be subject to a 125% multiplier for continuous loads in accordance with Article 220 NEC.

(ii) Critical branch system: The feeder conductors and equipment must be calculated in accordance with Article 220 NEC, including a level of diversity as determined by Article 220 NEC.

(b) Equipment branch: The feeder conductors and equipment used to supply electrical power to the equipment branch of the essential electrical system must be calculated in accordance with Article 220 NEC, including a level of diversity as determined by Article 220 NEC.

(c) Generator sizing: The rating of the generator(s) supplying electrical power to the essential system of a health care facility must be the summation of the loads determined in (a) and (b) of this subsection with no additional demand factors applied. Momentary X-ray loads may be ignored if the generator is rated at least 300% of the largest momentary X-ray load connected.

(2) Existing essential systems in facilities to which additional load is to be added:

(a) Existing loads: The existing loads of the separate branches of the essential electrical system may be determined by WAC 296-46A-140.

(b) Added loads: Added loads to the separate branches of the essential electrical system must be determined by subsection (1) of this section.

(c) Generators: Generators supplying electrical power to the essential electrical system must be determined by the summation of the loads determined by (a) and (b) of this subsection with no additional demand factors applied.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-517, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-550 Mobile/manufactured homes. (1)

An electrical service installed on the mobile/manufactured home:

(a) Must be installed only by the manufacturer, at the manufacturing plant. The manufacturer must complete the service except for service connections, meter, and grounding electrode conductor.

(b) The completion of the service, at the site, must be made by the owner or electrical contractor.

(2) All alterations to the mobile/manufactured home electrical system must be permitted and inspected by the factory assembled structures section of the department. Electrical wiring in structures that are attached to the mobile/manufactured home and the source of power is from the mobile/manufactured home is inspected by the factory assembled structures section of the department.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-550, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-553 Boat moorages, floating buildings, and similar installations. (1) Docks, wharves, boat moorages, floating buildings, and similar facilities in addition to complying with the appropriate sections of Article 553 or 555 NEC must have a readily accessible service rated disconnect located on the shoreline within sight of the dock, wharf, boat moorage, floating building, or similar facility.

(2) Extra-hard usage portable power cable may only be used when extending a feeder between the structures indicated above where flexibility is required and must be connected to an approved wiring method within the first fifteen feet of the point where flexibility is required.

(3) Where shore power is provided, each floating building or boat moorage berth must have a disconnecting means located within sight of each floating building or berth. The disconnecting means must be installed adjacent to but not in or on the floating building.

(4) Conductors operating in excess of 600 volts, nominal, may not be installed on floating portions of marinas, docks, or wharves. Refer to the Fire Protection Standard for Marinas and Boatyards, NFPA 303 for additional information.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-553, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-600 Electrical signs. (1) **General**—All electrical signs within the scope of U.L. Standard 48, the electrical sign standard, must be listed. All electrical signs outside the scope of U.L. Standard 48 will be inspected for compliance with the NEC.

(2) Portable outdoor signs.

(a) A weatherproof receptacle outlet that is weatherproof with the supply cord connected must be installed within six feet of each electrical sign.

(b) Extension cords are not permitted to supply portable outdoor signs.

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(c) All portable outdoor electrical signs must be listed or field evaluated by an electrical testing laboratory accredited by the department.

(3) Outdoor awnings.

(a) Lighting fixtures in outdoor awnings must be suitable for wet locations and be connected by a wiring method suitable for wet locations. Fluorescent lighting fixtures must be located at least six inches from the awning fabric. Incandescent lamps or fixtures must be located at least eighteen inches from the awning fabric. A disconnecting means must be installed per Article 600 NEC.

(b) Listed awning signs must be installed in compliance with the manufacturer's instructions and the NEC.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-600, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-680 Electrical equipment associated with spas, hot tubs, swimming pools or hydromassage bathtubs. (1) Package spa or hot tubs. Electrical heating, pumping, filtering, and/or control equipment installed within five feet of a spa or hot tub must be listed or field evaluated as a package with the spa or hot tub.

(2) A factory assembled skid pack of electrical heating, pumping, filtering, and/or control equipment (skid pack) must be installed more than five feet from a spa or hot tub and shall be listed as a package unit.

(3) Field installed, listed electrical equipment for a hot tub, spa, or swim spa must be located at least five feet from the hot tub, spa or swim spa, provided that:

(a) The heater is listed as a "spa heater or swimming pool heater";

(b) The pump is listed as a "spa pump" or "swimming pool/spa pump" (the pump may be combined with a filter assembly); and

(c) Other listed equipment such as panelboards, conduit, and wire are suitable for the environment and comply with the applicable codes.

(4) Field installed, listed electrical equipment for a swimming pool must be located at least five feet from the swimming pool provided that:

(a) The heater is listed as a "swimming pool heater or a spa heater";

(b) The pump is listed as a "swimming pool pump" or "spa pump" or "swimming pool/spa pump"; and

(c) Other equipment such as panelboards, conduit, and wire are suitable for the environment and comply with the applicable codes.

(d) The five-foot separation may be reduced by the installation of a permanent barrier, such as a solid wall, fixed glass windows or doors, etc. The five-foot separation will be determined by the shortest path or route that a cord can travel from the spa, hot tub, swim spa, or swimming pool to an object.

(5) The field assembly or installation of "recognized components" will not be permitted.

(6) Hydromassage bathtubs must be listed as a unit and bear a listing mark which reads "hydromassage bathtub."

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(7) Manufacturers instructions must be followed as part of the listing requirements.

(8) Electrical components which have failed and require replacement must be replaced with identical products unless the replacement part is no longer available; in which case, a like-in-kind product may be substituted provided the mechanical and grounding integrity of the equipment is maintained.

(9) Cut-away type display models may not be sold for other than display purposes and are not expected to bear a listing mark.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-680, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-700 Emergency systems. (1) Exit and emergency lights must be installed in accordance with the Article 700 NEC and the currently adopted edition of the Uniform Building Code in all health or personal care facilities defined in this chapter, educational facilities, institutional facilities, hotels, motels, and places of assembly for one hundred or more persons.

(2) Device and junction boxes for fire alarm systems other than the surface raceway type, must be substantially red in color, both inside and outside. Power-limited fire protective signaling circuit conductors must be durably and plainly marked in or on junction boxes or other enclosures to indicate that it is a power-limited fire protective signaling circuit.

(3) All boxes and enclosures, including transfer switches, generators, and power panels for emergency systems and circuits must be permanently identified with an identification plate that is substantially red in color.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-700, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-702 Optional standby systems. Optional standby systems derived from portable generators must meet all of the requirements of Article 702 NEC.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-702, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-900 Electrical work permits and fees.

(1) When an electrical work permit is required by chapter 19.28 RCW or this chapter, inspections may not be made, equipment must not be energized, or services connected unless:

(a) A valid electrical work permit is completely and legibly filled out and readily available;

(b) The classification or type of facility to be inspected and the exact scope and location of the electrical work to be performed are clearly shown on the electrical work permit;

(c) The address where the inspection is to be made is clearly identifiable from the street, road or highway that serves the premises; and

(d) Driving directions and/or a legible map must be provided for the inspectors' use.

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(2) Final inspection approval will not be made until all inspection fees are paid in full.

(3) An electrical work permit is valid for only one specific site address.

(4) A valid electrical work permit must be posted on the job site at a readily accessible and conspicuous location prior to beginning electrical work and at all times until the electrical inspection process is completed.

(5) Except for emergency repairs to existing electrical systems, electrical work permits must be obtained and posted at the job site prior to beginning the installation or alteration. An electrical work permit for emergency repairs to existing electrical systems must be obtained and posted at the job site no later than the next business day after the work is begun.

(6) Electrical work permits will expire one year after the date of purchase unless electrical work is actively and consistently in progress and inspections requested. Refunds are not available for expired electrical work permits or for electrical work permits where the electrical installation has begun, or an electrical inspection or electrical inspection request has been made.

(7) Fees must be paid in accordance with the inspection fee schedule, WAC 296-46A-910.

(8) Each person, firm, partnership, corporation, or other entity must furnish a valid electrical work permit for the installation, alteration, or other electrical work performed or to be performed by that entity. Each electrical work permit application must be signed by the electrical contractor's administrator (or designee) or the person, or authorized representative of the firm, partnership, corporation, or other entity that is performing the electrical installation or alteration. Permits purchased electronically do not require a handwritten signature. An entity designated to sign electrical permits must provide written authorization of the purchaser's designation when requested by the department.

(9) When allowed by the chief electrical inspector, annual permits for the inspection of telecommunications installations may be purchased by a building owner or licensed electrical/telecommunications contractor. Telecommunications work may be done under this annual permit by the building owner, the owner's regular employees, or a licensed electrical/telecommunications contractor. The permit holder is responsible for correcting all installation deficiencies. The permit holder must make available to the electrical inspector records of all the telecommunications work performed and the valid electrical or telecommunications contractor license numbers for all contractors working under the permit.

(10) Permits to be obtained by customers. Whenever a serving electrical utility performs work for a customer under one of the exemptions in WAC 296-46A-935 and the work is subject to inspection, the customer is responsible for obtaining all required permits.

(11) As required by chapter 19.28 RCW or this chapter, an electrical work permit is required for the installation, alteration, or maintenance of electrical systems except for: Plug-in appliances, travel trailers, or like-in-kind replacement of a: Circuit breaker, fuse, lamp, snap switch, receptacle outlet, heating element, lighting fixture ballast with an exact same

ballast, contactor, relay, timer, starter, similar control component, or motor.

(12) An electrical work permit is required for all installations of telecommunications systems on the customer side of the network demarcation point for projects greater than ten telecommunications outlets. All backbone installations regardless of size and all telecommunications cable or equipment installations involving penetrations of fire barriers or passing through hazardous locations require permits and inspections. For the purposes of determining the inspection threshold for telecommunications projects greater than ten outlets, the following will apply:

(a) An outlet is the combination of jacks and mounting hardware for those jacks, along with the associated cable and telecommunications closet terminations, that serves one workstation. In counting outlets to determine the inspection threshold, one outlet must not be associated with more than six standard four-pair cables or more than one twenty-five-pair cable. Therefore, installations of greater than sixty four-pair cables or ten twenty-five-pair cables require permits and inspections. (It is not the intent of the statute to allow large masses of cables to be run to workstations or spaces serving telecommunications equipment without inspection. Proper cable support and proper loading of building structural elements are safety concerns. When considering total associated cables, the telecommunications availability at one workstation may count as more than one outlet.)

(b) The installation of greater than ten outlets and the associated cables along any horizontal pathway from a telecommunications closet to work areas during any continuous ninety-day period requires a permit and inspection.

(c) All telecommunications installations within the residential dwelling units of single-family, duplex, and multi-family dwellings do not require permits or inspections. In residential multifamily dwellings, permits and inspections are required for all backbone installations, all fire barrier penetrations, and installations of greater than ten outlets in common areas.

(d) No permits or inspections are required for installation or replacement of cord and plug connected telecommunications equipment or for patch cord and jumper cross-connected equipment.

(e) Definitions of telecommunications technical terms will come from chapter 19.28 RCW or the currently adopted rules, EIA/TIA standards, and NEC.

(13) Requests for inspections must be made no later than three business days after completion of the electrical/telecommunications installation or one business day after any part of the installation has been energized, whichever occurs first. Inspections for annual electrical maintenance permits and annual telecommunications permits may be done on a regular schedule arranged by the permit holder with the department.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-900, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-910 Inspection fees. To calculate inspection fees, the amperage is based on the conductor

ampacity or the overcurrent device rating. The total fee must not be less than the number of progress inspection (one-half hour) units times the progress inspection fee rate from subsection (8) PROGRESS INSPECTIONS below.

(1) RESIDENTIAL.

(a) Single and two-family residential (new construction).

Notes: • Square footage is the area included within the surrounding exterior walls of a building exclusive of any interior courts. (This includes any floor area in an attached garage, basement, or unfinished living space.)

• "Inspected with the service" means that a separate service inspection fee is included on the same electrical work permit and "inspected at the same time" means all wiring is to be ready for inspection during the initial inspection trip.

• An "outbuilding" is a structure that serves a direct accessory function to the residence, such as a pump house or storage building. Outbuilding does not include buildings used for commercial type occupancies or additional dwelling occupancies.

- (i) First 1300 sq. ft. \$ 67.00
- Each additional 500 sq. ft. or portion of \$ 21.50
- (ii) Each outbuilding or detached garage inspected at the same time as a dwelling unit on the property \$ 28.00
- (iii) Each outbuilding or detached garage inspected separately \$ 44.25
- (iv) Each swimming pool - inspected with the service \$ 44.25
- (v) Each swimming pool - inspected separately \$ 67.00
- (vi) Each hot tub, spa, or sauna - inspected with the service \$ 28.00
- (vii) Each hot tub, spa, or sauna - inspected separately \$ 44.25
- (viii) Each septic pumping system - inspected with the service \$ 28.00
- (ix) Each septic pumping system - inspected separately \$ 44.25
- (b) Multifamily residential and miscellaneous residential structures, services and feeders (new construction).

(i) Each service and/or feeder

Ampacity	Service/Feeder	Additional Feeder
0 to 200	\$ 72.25	\$ 21.50
201 to 400	\$ 89.75	\$ 44.25
401 to 600	\$ 123.25	\$ 61.50
601 to 800	\$ 158.00	\$ 84.25
801 and over	\$ 225.25	\$ 169.00

(c) Single-family or multi-family altered services including circuits.

(i) Each altered service and/or altered feeder

Ampacity	Service or Feeder
0 to 200	\$ 61.50
201 to 600	\$ 89.75
601 and over	\$ 135.25

(ii) Maintenance or repair of meter or mast (no alterations to service or feeder) \$ 33.50

(d) Single or multi-family residential circuits only (no service inspection).

Note: Altered or added circuit fees are calculated per panelboard. Total cost of the alterations in an individual panel should not exceed the cost of a complete altered service or feeder of the same rating, as shown in subsection (1) RESIDENTIAL (c) (table) above.

(i) 1 to 4 circuits (see note) \$ 44.25

• Except: Water heater load control devices installed in residences as part of an energy conservation program \$ 27.00

Note: The \$27.00 permit fee for water heater load control devices will expire on December 31, 2001.

(ii) Each additional circuit (see note) \$ 5.00

(e) Mobile homes, modular homes, mobile home parks, and RV parks.

(i) Mobile home or modular home service or feeder only \$ 44.25

(ii) Mobile home service and feeder \$ 72.25

(f) Mobile home park sites and RV park sites.

Note: For master service installations, see subsection (2).

(i) First site service or site feeder \$ 44.25

- (ii) Each additional site service; or additional site feeder inspected at the same time as the first service or feeder \$ 28.00
- (2) COMMERCIAL/INDUSTRIAL.
- (a) New service or feeder and additional new feeders inspected at the same time (includes circuits).

Note: For large COMMERCIAL/INDUSTRIAL projects that include multiple feeders, "inspected at the same time" can be interpreted to include additional inspection trips for a single project. The additional inspections must be for electrical work specified on the permit at the time of purchase. The permit fee for such projects must be calculated from (2) (a) (i) (table) above. However, the total fee must not be less than the number of progress inspection (one-half hour) units times the progress inspection fee rate from subsection (8) PROGRESS INSPECTIONS below.

Ampacity	Service/Feeder	Additional Feeder
0 to 100	\$ 72.25	\$ 44.25
101 to 200	\$ 89.75	\$ 56.25
201 to 400	\$ 169.00	\$ 67.00
401 to 600	\$ 197.00	\$ 78.75
601 to 800	\$ 254.50	\$ 107.25
801 to 1000	\$ 310.75	\$ 129.75
1000 and over	\$ 339.00	\$ 181.00

- (b) Altered services or feeders (no circuits).
- (i) Service/feeders

Ampacity	Service or Feeder
0 to 200	\$ 72.25
201 to 600	\$ 169.00
601 to 1000	\$ 254.50
1000 and over	\$ 282.75

- (ii) Maintenance or repair of meter or mast (no alteration to the service or feeder) \$ 61.50
- (c) Circuits only.

Note: Altered/added circuit fees are calculated per panelboard. Total cost of the alterations in a panel (or panels) should not exceed the cost of a new feeder (or feeders) of the same rating, as shown in subsection (2) COMMERCIAL/INDUSTRIAL (a)(i)(table) above.

- (i) First five circuits per branch circuit panel \$ 56.25
- (ii) Each additional circuit per branch circuit panel \$ 5.00
- (d) Over 600 volts surcharge per permit. \$ 56.25
- (3) TEMPORARY SERVICE(S).

Notes: • Temporary electrical power and lighting installations must be used during the period of construction, remodeling, maintenance, repair, or demolition of buildings, structures, equipment, or similar activities.

• Temporary electrical power and lighting installations are allowed during emergencies and for tests, experiments, and developmental work. Temporary electrical power and lighting installations are allowed for a period not to exceed 90 days for Christmas decorative lighting and similar purposes. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

• Temporary stage or concert inspections requested outside of normal business hours will be subject to the portal-to-portal hourly fees in subsection (11) OTHER INSPECTIONS. The fee for such after hours inspections shall be the greater of the fee from (3) TEMPORARY SERVICES (a) or the portal-to-portal fee.

- (a) Temporary services, temporary stage or concert productions.

Ampacity	Service/Feeder	Additional Feeder
0 to 60	\$ 38.75	\$ 20.00
0 to 100	\$ 44.25	\$ 21.50
101 to 200	\$ 56.25	\$ 28.00
201 to 400	\$ 67.00	\$ 33.50
401 to 600	\$ 89.75	\$ 44.25
601 and over	\$ 101.75	\$ 50.75

(4) IRRIGATION MACHINES, PUMPS AND EQUIPMENT.

- (a) Irrigation machines.
- (i) Each tower when inspected at the same time as a service and feeder from (2) COMMERCIAL/INDUSTRIAL \$ 5.00
- (ii) Towers - when not inspected at the same time as a service and feeders - one to six towers \$ 67.00

- (iii) Each additional tower \$ 5.00
- (5) MISCELLANEOUS - commercial/industrial and residential.
- (a) Low-voltage thermostats.
- (i) First thermostat \$ 33.50
- (ii) Each additional thermostat inspected at the same time as the first \$ 10.50

(b) Low-voltage systems and telecommunications systems. Includes all telecommunications installations, fire alarm and burglar alarm nurse call, intercom, security systems, energy management control systems, HVAC/refrigeration control systems (other than thermostats above), industrial and automation control systems, lighting control systems, stand-alone sound systems, public address, and similar low-energy circuits and equipment.

- (i) First 2500 sq. ft. or less \$ 38.75
- (ii) Each additional 2500 sq. ft. or portion of \$ 10.50
- (c) Signs and outline lighting.
- (i) First sign (no service included) \$ 33.50
- (ii) Each additional sign inspected at the same time on the same building or structure \$ 16.00

(d) Berth at a marina or dock.

Note: Five berths or more shall be permitted to have the inspection fees based on appropriate service and feeder fees from section (2) COMMERCIAL/INDUSTRIAL (a)(i) above.

- (i) Berth at a marina or dock \$ 44.25
- (ii) Each additional berth inspected at the same time \$ 28.00
- (e) Yard pole, pedestal, or other meter loops only.
- (i) Yard pole, pedestal, or other meter loops only \$ 44.25
- (ii) Meters installed remote from service equipment: \$ 10.50

Inspected at same time as service, temporary service or other installations

- (f) Emergency inspections requested outside normal work hours. Regular fee plus surcharge of: \$ 84.25

(g) Generators.

- (i) Portable generators: Permanently installed transfer equipment for portable generators \$ 61.50

(ii) Permanently installed generators: Refer to appropriate residential or commercial new service or feeder section

- (h) Annual permit fee for plant location employing regular electrical maintenance staff - each inspection two-hour maximum.

	Inspections	Fee
1 to 3 plant electricians	12	\$ 1,618.00
4 to 6 plant electricians	24	\$ 3,237.50
7 to 12 plant electricians	36	\$ 4,856.00
13 to 25 plant electricians	52	\$ 6,475.50
more than 25 plant electricians	52	\$ 8,095.00

- (i) Telecommunications annual permit fee.

(i) For commercial/industrial location employing full-time telecommunications maintenance staff or having a yearly maintenance contract with a licensed electrical/telecommunications contractor. Annual inspection time required may be estimated by the purchaser at the rate for "Other inspections" in this section, charged portal-to-portal per hour - two-hour minimum.

- Each additional hour, or portion thereof, of portal-to-portal inspection time \$ 67.00

(6) CARNIVAL INSPECTIONS.

(a) First carnival field inspection each year.

- (i) Each ride and generator truck \$ 16.00
- (ii) Each remote distribution equipment, concession or gaming show \$ 5.00

- (iii) If the calculated fee for first field inspection of (a) and (b) above is less, the minimum inspection fee shall be: \$ 84.25

(b) Subsequent carnival inspections.

- (i) First 10 rides, concessions, generators, remote distribution equipment or gaming show \$ 84.25
- (ii) Each additional ride, concession, generator, remote distribution equipment or gaming show \$ 5.00

(c) Concession(s) or ride(s) not part of a carnival.

- (i) First field inspection each year of a single concession or ride, not part of a carnival \$ 67.00

- (ii) Subsequent inspection of a single concession or ride, not part of a carnival \$ 44.25

(7) TRIP FEES.

- (a) Requests by property owners to inspect existing installations. \$ 67.00
- (b) Submitter notifies the department that work is ready for inspection when it is not ready. \$ 33.50
- (c) Additional inspection required because submitter has provided the wrong address. \$ 33.50
- (d) More than one additional inspection required to inspect corrections; or for repeated neglect, carelessness, or improperly installed electrical work. \$ 33.50
- (e) Each trip necessary to remove a noncompliance notice. \$ 33.50
- (f) Corrections have not been made in the prescribed time, unless an exception has been requested and granted. \$ 33.50
- (g) Installations that are covered or concealed before inspection. \$ 33.50

(8) PROGRESS INSPECTIONS.

Note: The fees calculated in subsections (1) through (6) must apply to all electrical work. This section must be applied to a permit where the permit holder has requested additional inspections beyond the number supported by the permit fee calculated at the rate in (1) through (6).

- (a) On partial or progress inspections, each one-half hour. \$ 33.50
- (9) PLAN REVIEW FEE.
- (a) Fee is thirty-five percent of the electrical work permit fee as determined by WAC 296-46A-910, plus a plan review submission fee of: \$ 56.25

- (b) Supplemental submissions of plans per hour or fraction of an hour. \$ 67.00
- (c) Plan review shipping and handling fee. \$ 16.00

(10) OUT-OF-STATE INSPECTIONS.

(a) Permit fees will be charged according to the fees listed in this section.

- (b) Travel expenses:
- (i) All travel expenses and per diem for out-of-state inspections are billed following completion of each inspection(s). These expenses can include, but are not limited to: Inspector's travel time, travel cost and per diem at the state rate. Travel time is hourly based on the rate in subsection (11) of this section

(11) OTHER INSPECTIONS.

- (a) Inspections not covered by above inspection fees must be charged portal-to-portal per hour: \$ 67.00

(12) REFUND PROCESSING FEE.

- (a) All requests for permit fee refunds will be assessed a processing fee. \$ 10.50

(13) VARIANCE REQUEST PROCESSING FEE.

- (a) Variance request processing fee. This fee is nonrefundable once the transaction has been made. \$ 67.00

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-910, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-915 Electrical/telecommunications contractor license, administrator certificate and examination, and copy fees.

- (1) GENERAL OR SPECIALTY CONTRACTOR LICENSE (per twenty-four month period) \$ 216.25
- (a) Reinstatement of a general or specialty contractor's license after a suspension \$ 43.50
- (2) ADMINISTRATOR CERTIFICATE
- Note: Failure to appear for an examination results in forfeiture of the examination fee.
- (a) Administrator certificate examination application (nonrefundable) \$ 27.00
- (b) Administrator first-time examination fee \$ 64.75
- (c) Administrator retest examination fee \$ 75.75
- (d) Administrator original certificate (request for certificate submitted with application) \$ 64.50
- (e) Administrator certificate renewal (per twenty-four month period) \$ 81.00

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- (f) Late renewal of administrator certificate (per twenty-four month period) \$ 162.25
- (g) Transfer of administrator designation \$ 32.25
- (h) Certified copy of each document (maximum per file): \$ 45.75
 - First document: \$ 20.75
 - Each additional document: \$ 2.00
- (i) Reinstatement of an administrator's certificate after a suspension \$ 43.50
- (3) REFUND PROCESSING FEE \$ 10.50

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-915, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-920 Civil penalty.

- Notes:
- (A) Each day that a violation occurs will be a separate offense.
 - (B) Once a violation of chapter 19.28 RCW, or chapter 296-46A or 296-401B WAC becomes a final judgment, any additional violation within three years becomes a "second" or "additional" offense subject to an increased penalty as set forth in the following tables.
 - (C) In case of continued, repeated or gross violation of the provisions of chapter 19.28 RCW, or chapter 296-46A or 296-401B WAC or if property damage or bodily injury occurs as a result of the failure of a person, firm, partnership, corporation, or other entity to comply with chapter 19.28 RCW, the department may double the penalty amounts shown in subsections (1) through (13) of this section.
 - (D) A person, firm, partnership, corporation or other entity who violates a provision of chapter 19.28 RCW, chapter 296-46A or 296-401B WAC is liable for a civil penalty based upon the following schedule.

(1) Offering to perform, submitting a bid for, advertising, installing or maintaining cables, conductors or equipment:

- (a) That convey or utilize electrical current without having a valid electrical contractor license.
- (b) Used for information generation, processing, or transporting of signals optically or electronically in telecommunications systems without having a valid telecommunications contractor license.

First offense:	\$ 500
Second offense:	\$ 1,000
Third offense:	\$ 3,000
Each offense thereafter:	\$ 5,000

(2) Employing an individual for the purposes of chapter 19.28 RCW who does not possess a valid certificate of competency or training certificate to do electrical work.

First offense:	\$ 100
Second offense:	\$ 350
Each offense thereafter:	\$ 500

(3) Performing electrical work without having a valid certificate of competency or electrical training certificate.

First offense:	\$ 100
Second offense:	\$ 250
Each offense thereafter:	\$ 500

(4) Employing electricians and electrical trainees for the purposes of chapter 19.28 RCW in an improper ratio.

First offense: \$ 250
 Second offense: \$ 350
 Each offense thereafter: \$ 500

(5) Failing to provide proper supervision to an electrical trainee as required by chapter 19.28 RCW.

First offense: \$ 250
 Second offense: \$ 350
 Each offense thereafter: \$ 500

(6) Working as an electrical trainee without proper supervision as required by chapter 19.28 RCW.

First offense: \$ 50
 Second offense: \$ 100
 Each offense thereafter: \$ 250

(7) Offering, bidding, advertising, or performing electrical or telecommunications installations, alterations or maintenance outside the scope of the firm's specialty electrical or telecommunications contractors license.

First offense: \$ 250
 Second offense: \$ 500
 Each offense thereafter: \$ 1,000

(8) Selling or exchanging electrical equipment associated with spas, hot tubs, swimming pools or hydromassage bathtubs which is not listed by an approved electrical testing laboratory.

First offense: \$ 500
 Second offense: \$ 1,000
 Each offense thereafter: \$ 2,000

Definition: The sale or exchange of electrical equipment associated with hot tubs, spas, swimming pools or hydromassage bathtubs means: "Sell, offer for sale, advertise, display for sale, dispose of by way of gift, loan, rental, lease, premium, barter or exchange."

(9) Covering or concealing installations prior to inspection.

First offense: \$ 500
 Second offense: \$ 1,000
 Each offense thereafter: \$ 2,000

(10) Failing to make corrections within fifteen days of notification by the department. Exception: Where an extension has been requested and granted, this penalty applies to corrections not completed within the extended time period.

First offense: \$ 250
 Second offense: \$ 500
 Each offense thereafter: \$ 1,000

(11) Failing to obtain or post an electrical/telecommunications work permit prior to beginning the electrical/telecommunication installation or alteration. Exception: In cases of emergency repairs to existing electrical/telecommunications systems, this penalty will not be charged if the permit is obtained and posted no later than the business day following completion of the emergency repair.

First offense: \$ 250
 Homeowner - First offense: \$ 50
 Second offense: \$ 500
 Each offense thereafter: \$ 1,000

(12) Violating chapter 19.28 RCW duties of the electrical/telecommunications administrator.

First offense: \$ 100
 Second offense: \$ 500
 Each offense thereafter: \$ 1,000

(13) Violating any of the provisions of chapter 19.28 RCW or chapter 296-46A or 296-401B WAC which are not identified in subsections (1) through (12) of this section.

First offense: \$ 250
 Second offense: \$ 500
 Each offense thereafter: \$ 1,000

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-920, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-930 Electrical/telecommunications contractor license and administrator certificate designation. (1) **General electrical (01):** A general electrical license and/or administrator's certificate encompasses all phases and all types of electrical and telecommunications installations.

(2) Specialty (limited) electrical licenses and/or administrator's certificates are as follows:

(a) **Residential (02):** Limited to the wiring of one and two family dwellings, or multifamily dwellings not exceeding three floors above grade. All wiring is limited to nonmetallic sheathed cable, except for services and/or feeders, exposed installations where physical protection is required, and for wiring buried below grade.

This specialty also includes the wiring for ancillary structures such as, but not limited to: Swimming pools, septic pumping systems, domestic water systems, limited energy systems (e.g., doorbells, intercoms, fire alarm, burglar alarm, energy control, HVAC/refrigeration, etc.), apartment complex offices/garages, site lighting when supplied from the residence or ancillary structure, and other structures directly associated with the functionality of the residential units.

This specialty does not include wiring occupancies defined in WAC 296-46A-130, commercial occupancies such as: Motels, hotels, offices, assisted living facilities, or stores.

This specialty cannot perform the work of other specialties in other than the residential occupancies defined in this subsection.

(b) Pumps, irrigation, and wells.

(i) Pump and irrigation (03): Limited to the electrical connection of domestic and irrigation water pumps, circular irrigating systems and related pumps and pump houses. This specialty includes circuits, feeders, controls, and services to supply said pumps. This specialty may perform the work defined in (ii) of this subsection.

(ii) Domestic well (03A): Limited to the extension of a branch circuit, which is supplied and installed by others, to pump controllers; pressure switches; alarm sensors; and water pumps which do not exceed 7 1/2 horsepower at 230 volts AC single phase.

(c) Signs (04): Limited to placement and connection of signs and outline lighting, the electrical supply, related controls and associated circuit extensions thereto; and the installation of a maximum 60 ampere, 120/240 volt single phase service to supply power to a remote sign only. This specialty may service, maintain, or repair exterior lighting fixtures that are mounted on a pole or other structure with like-in-kind components.

(d) Domestic appliances (05): Limited to the electrical connection of household appliances and the wiring thereto; such as hot water heaters, ranges, dishwashers, clothes dryers, oil and gas furnaces, and similar appliances. This specialty includes circuits to the appliances; however, it does not include the installation of service and/or feeders or circuits to electric furnaces and heat pump equipment.

(e) Limited energy.

(i) Limited energy system (06): Limited to the installation of signaling and power limited circuits and related equipment. This specialty is restricted to low-voltage circuits. This specialty includes the installation of fire protection signaling systems, intrusion alarms, energy management and control systems, industrial and automation control systems, lighting control systems, commercial and residential amplified sound, public address systems, and such similar low-energy circuits and equipment. Limited energy electrical contractors may perform all telecommunications work under their specialty (06) electrical license and administrator's certificate. This specialty may perform the work defined in (ii) of this subsection.

(ii) HVAC/refrigeration limited energy system (06A): Limited to the installation of low-voltage, Class 2 HVAC/refrigeration control circuit cables for control of furnaces, heat pumps, and similar HVAC or refrigeration equipment when such conductors do not connect to other than HVAC or refrigeration equipment and when such buildings do not exceed three floors above grade, except for residential occupancies. Associated limited energy control components that are integral with, and control the operation of, the heating and cooling equipment or refrigeration equipment are included in the scope of this specialty. These limited energy components include, but are not limited to, the following: Thermostats, humidistats, low-voltage damper controls, outdoor sensing controls, outside air dampers, air monitoring devices, stand-alone duct smoke detectors exclusively con-

trolled by or directly related to the HVAC/refrigeration system, zone control valves, and the mounting of HVAC/refrigeration control panels and low-voltage connections. Installation of integrated building control systems, other than HVAC/refrigeration systems as defined herein, are not included in this specialty.

This specialty may install, service, maintain, repair, or replace HVAC/refrigeration electrical systems as long as the work is on the HVAC/refrigeration system itself. This specialty may replace line voltage components within the equipment, only if the components are like-in-kind with similar voltage and current ratings. Reconnection of replaced line voltage HVAC/refrigeration components and equipment, including line supply whips not over 6 feet in length, is permitted provided there are no modifications to the characteristics of the branch circuit/feeder. This specialty may not install branch circuit (line voltage) conductors, services, feeders, panelboards, or disconnect switches to HVAC/refrigeration equipment. Short sections of raceway may be installed for access to or physical protection of cables; however, wiring in conduit systems and wiring in classified locations are excluded from this specialty.

(f) Maintenance.

(i) Nonresidential maintenance (07): Limited to maintenance, repair and replacement of like-in-kind existing electrical equipment and conductors on industrial or commercial premises. This specialty does not include maintenance activities in residential dwellings defined in (a) of this subsection for the purposes of accumulating training experience toward qualification for the residential electrician (02) specialty examination. This specialty may perform the work defined in (ii) and (iii) of this subsection.

(ii) Nonresidential lighting maintenance and lighting retrofit (07A): Limited to working within the housing of existing nonresidential lighting fixtures for work related to repair, service, maintenance of lighting fixtures and installation of energy efficiency lighting retrofit upgrades. This specialty includes replacement of lamps, ballasts, sockets and the installation of listed lighting retrofit reflectors and kits. All work is limited to the fixture body, except remote located ballasts may be replaced or retrofitted with approved products. This specialty does not include installing new fixtures or branch circuits; moving or relocating existing fixtures; or altering existing branch circuits.

(iii) Residential maintenance (07B): This specialty is limited to residential dwellings as defined in WAC 296-46A-930 (2)(a), multistory dwelling structures with no commercial facilities, and the interior of dwelling units in multistory structures with commercial facilities. This specialty may maintain, repair, or replace (like-in-kind) existing lighting fixtures, hot water heaters, ranges, electric heaters, similar domestic appliances, and all permit exempted work as defined in WAC 296-46A-900(11).

This specialty is limited to equipment and circuits of 240 volts, 60 amperes, single phase maximum.

This specialty may disconnect and reconnect low voltage control and line voltage supply whips not over 6 feet in length provided there are no modifications to the characteristics of the branch circuit.

For the purpose of this specialty, "electrical equipment" does not include electrical conductors.

(g) **Telecommunications (09):** Limited to the installation, maintenance, and testing of telecommunications systems, equipment, and associated hardware, pathway systems, and cable management systems. The scope of work includes:

(i) Installation of open wiring systems of telecommunications cables.

(ii) Surface nonmetallic raceways designated and used exclusively for telecommunications.

(iii) Optical fiber innerduct raceway.

(iv) Underground raceways designated and used exclusively for telecommunications and installed for additions or extensions to existing telecommunications systems not to exceed fifty feet inside the building.

(v) Incidental short sections of circular or surface metal raceway, not to exceed ten feet, for access or protection of telecommunications cabling and installation of cable trays and ladder racks in telecommunications service entrance rooms, spaces, or closets.

(vi) Audio or paging systems where the amplification is integrated into the telephone system equipment.

(vii) Audio or paging systems where the amplification is provided by equipment listed as an accessory to the telephone system equipment and requires the telephone system for the audio or paging system to function.

(viii) Closed circuit video monitoring systems if there is no integration of line or low-voltage controls for cameras and equipment. Remote controlled cameras and equipment are considered (intrusion) security systems and must be installed by licensed electrical contractors and certified electricians.

Telecommunications systems do not include horizontal cabling used for fire protection signaling systems, intrusion alarms, access control systems, patient monitoring systems, energy management control systems, industrial and automation control systems, HVAC/refrigeration control systems, lighting control systems, and stand-alone amplified sound or public address systems. Telecommunications systems may interface with other building signal systems including security, alarms, and energy management at cross-connection junctions within telecommunications closets or at extended points of demarcation. Telecommunications systems do not include the installation or termination of premises line voltage service, feeder, or branch circuit conductors or equipment. Horizontal cabling for a telecommunications outlet, necessary to interface with any of these systems outside of a telecommunications closet, is the work of the telecommunications contractor.

(h) **Door, gate, and similar systems (10):** Limited to the installation of:

(i) This specialty may install, service, maintain, repair, or replace door/gate/similar systems electrical operator systems including:

(A) Low-voltage, NEC Class 2, door/gate/similar systems electrical operator systems where the door/gate/similar systems electrical operator system is not connected to other systems.

(B) Branch circuits originating in a listed door/gate/similar systems electric operator control panel that supplies only door/gate/similar systems system components providing:

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The branch circuit does not exceed 20 amperes or 600 volts and the component is within sight of the listed door/gate/similar systems electric operator control panel.

(ii) Door/gate/similar systems electrical operator systems include electric gates, doors, windows, awnings, movable partitions, curtains and similar systems. These systems include, but are not limited to: Electric gate/door/similar systems operators, control push buttons, key switches, key pads, pull cords, air and electric treadle, air and electric sensing edges, coil cords, take-up reels, clocks, photo electric cells, loop detectors, motion detectors, remote radio and receivers, antenna, timers, lock-out switches, stand-alone release device with smoke detection, strobe light, annunciator, control panels, wiring and termination of conductors.

(iii) Reconnection of line voltage power to a listed door/gate/similar systems electric operator control panel is permitted provided:

(A) There are no modifications to the characteristics of the branch circuit/feeder;

(B) The circuit/feeder does not exceed 20 amperes or 600 volts; and

(C) The conductor or conduit extending from the branch circuit/feeder disconnecting means or junction box does not exceed six feet in length.

(iv) Wiring in classified locations as described in Chapter 5 NEC is excluded from this specialty. This specialty may not install, repair, or replace branch circuit (line voltage) conductors, services, feeders, panelboards, or disconnect switches supplying the door/gate/similar systems electric operator control panel.

(3) Combination specialty contractor license. The department may issue a combination specialty contractor license to a firm that qualifies for more than one specialty contractor license. The assigned administrator must be certified in all specialties applicable to the combination specialty contractor license. The license will plainly indicate the specialty licenses included in the combination license. An administrator assigned to a telecommunications contractor must be certified as a telecommunications administrator.

(4) Combination specialty administrator certificate. The department may issue a combination specialty administrator certificate to an individual who qualifies for more than one specialty administrators' certificate. The combination specialty administrators' certificate will plainly indicate the specialty administrators' certificate(s) the holder has qualified for.

(5) A specialty electrical contractor, other than the (06) limited energy specialty electrical contractor, may only perform telecommunications work within the equipment or occupancy limitations of their specialty electrical contractor license and administrator certification. Any other telecommunications work requires a telecommunications contractor license and telecommunications administrator certification.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-930, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-931 Electrical/telecommunications contractor license. (1) The department will issue an electrici-

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cal/telecommunications contractor license that will expire twenty-four months following the date of issue to a person, firm, partnership, corporation or other entity that complies with chapter 19.28 RCW. An electrical/telecommunications contractor license will not be issued to or renewed for a person, firm, or partnership unless the Social Security number, date of birth, and legal address of the individual legal owner(s) are submitted with the application. The department may issue an electrical/telecommunications contractor license for a period greater or less than twenty-four months for the purpose of equalizing the number of electrical contractor licenses that expire each month. The department will prorate the electrical/telecommunications contractor license fee according to the number of months in the license period.

(2) The department may deny application or renewal of an electrical/telecommunications contractor's license if an owner, partner, or corporate officer owes outstanding final judgments to the department.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-931, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-932 Electrical/telecommunications contractor cash or securities deposit. Cash or securities deposit release. A cash or security deposit which has been filed with the department in lieu of a surety bond, will not be released until one year after the date the electrical/telecommunications contractor notifies the department in writing, that the person, firm, partnership, corporation, or other entity who (which) has been issued the electrical/telecommunications contractor's license, has ceased to do business in the state of Washington.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-932, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-933 Telecommunications contractor insurance. (1) To obtain a telecommunications contractor's license the applicant must provide to the department an original certificate of insurance naming the department of labor and industries, electrical section as certificate holder. Insurance coverage must be no less than twenty thousand dollars for injury or damages to property, fifty thousand dollars for injury or damage including death to any one person, and one hundred thousand dollars for injury or damage including death to more than one person. The certificate of insurance must be issued as continuous until canceled. The insurance will be considered a continuing obligation unless canceled by the insurance company. The insurance company must notify the department in writing ten days prior to the effective date of said cancellation or failure to renew.

(2) The telecommunications contractor may furnish to the department an assigned account to meet the insurance requirements in lieu of a certificate of insurance. An account assigned to the department for insurance requirements will be held in place for three years after the contractor's license is expired, revoked, or the owner notifies the department in writing that the company is no longer doing business in the

state of Washington as a telecommunications contractor. The account will be released by the department providing there is no pending legal action against the contractor.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-933, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-934 Electrical contractor exemptions.

(1) Low voltage thermocouple derived circuits and low voltage circuits, powered from a listed Class 2 power supply(ies), for low voltage built-in residential vacuum systems, low voltage circuits for underground landscape sprinkler systems, low voltage circuits for underground landscape lighting, or low voltage circuits for residential garage doors are not included in the requirements for licensing in chapter 19.28 RCW, provided:

(a) Installation and termination of line voltage equipment and conductors supplying these systems is performed by appropriately licensed and certified electrical contractors and electricians.

(b) Conductors of these systems do not pass through fire-rated walls, fire-rated ceilings or fire-rated floors in other than residential units.

Electrical failure of these systems does not inherently or functionally compromise safety to life or property.

(2) Firms who clean and/or replace lamps in lighting fixtures are not included in the requirements for licensing in chapter 19.28 RCW.

(3) Firms who install listed factory assembled cord and plug connected equipment are not included in the requirements for licensing in chapter 19.28 RCW.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-934, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-935 Electrical utility exemptions. (1)

Utility system exemption. Neither a serving electrical utility nor a contractor employed by the serving electrical utility is required to have a license for work on the "utility system" or on service connections or on meters and other apparatus or appliances used to measure the consumption of electricity.

(2) Street lighting exemption. A serving electrical utility is not required to have a license to work on electrical equipment used in the lighting of streets, alleys, ways, or public areas or squares.

(3) Customer-owned equipment exemption. A serving electrical utility is not required to have a license to work on electrical equipment owned by a commercial, industrial, or public institution customer if:

(a) The utility has not solicited such work; and

(b) Such equipment:

(i) Is located outside a building or structure; and

(ii) The work performed is on the primary side of the customer's transformer(s) which supplies power at the customer's utilization voltage.

(4) Independent power production equipment exemption. A serving electrical utility is not required to have a license to work on electrical equipment owned by a customer that is an independent power producer if:

(a) The customer has entered into an agreement to sell electricity to a utility or to a third party; and

(b) The electrical equipment is used to transmit electricity from the terminals of an electrical generating unit located on premises used by the customer to the point of interconnection with the utility system.

(5) Exempted equipment and installations. No person, firm, partnership, corporation, or other entity is required to have a license for work on electrical equipment and installations thereof that are exempted by RCW 19.28.091 or 19.28.151.

(6) Exemption from inspection.

(a) The work of a serving electrical utility and its contractors on the utility system is not subject to inspection. The utility is responsible for inspection and approval for the installation.

(b) Work exempted by Article 90-2 (B)(5) NEC, 1981 edition, is not subject to inspection.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-935, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-940 Manufacturers of electrical/telecommunications products exemptions. (1) Manufacturers of electrical/telecommunications systems products will be allowed to utilize their factory-trained personnel to perform initial calibration, testing, adjustment, modification incidental to the startup and checkout of the equipment, or replacement of components within the confines of the specific product, without permit or required licensing, provided:

(a) The product has not been previously energized or is within the manufacturer's warranty.

(b) Modifications, as designated above, must not include changes to the original intended configuration nor changes or contact with external field-connected components.

(c) The manufacturer will be responsible for obtaining any required reapproval/recertification from the original listing or field evaluation laboratory.

(d) The manufacturer must notify the department if reapproval/recertification is required.

(2) No license under the provision of this chapter will be required from any manufacturer or any person, firm, partnership, or other entity employed by or authorized by a manufacturer of power generation equipment assemblies for the following work on premanufactured electric power generation equipment assemblies and control gear:

(a) Testing, repair, modification, maintenance, and installation of components internal to the transfer switch, or replacement of components within the confines of the specific product incidental to the startup and checkout of the equipment: Provided, the product has not been previously energized and/or is within the manufacturer's warranty. Modifications of the transfer switch must not include changes to the original intended configuration nor changes or contact with externally field-connected components. The manufacturer will be responsible for obtaining any required reapproval or recertification from the original listing agent;

(b) Testing, repair, modification, maintenance, or installation of components internal to the control gear;

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(c) Testing, repair, modification, maintenance, or installation of components internal to the premanufactured power generation unit.

Premanufactured electric power generation equipment assemblies are made up of reciprocating internal combustion engines and the associated control gear equipment. Control gear equipment includes control logic, metering, and annunciation for the operation and the quality of power being generated by the reciprocating internal combustion engine and does not have the function of distribution of power.

(d) For the purposes of this subsection, the following work on premanufactured electric power generation equipment assemblies is not exempt from the requirements of chapter 19.28 RCW.

(i) Installation or connection of conduit or wiring between the power generation unit, transfer switch, control gear;

(ii) Installation of the transfer switch;

(iii) Connections between the power generation unit, transfer switch, control gear, and utility's transmission or distribution systems;

(iv) Connections between the power generation unit, transfer switch, control gear, and any building or structure;

(v) Test connections with any part of:

(A) The utility's transmission or distribution system;

(B) The building or structure.

(3) Nothing in this section will alter or amend any other exemptions from or requirement for licensure under this chapter.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-940, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-950 Administrator certificate. (1) The department must issue an administrator certificate to a person who qualifies for a certificate in accordance with chapter 19.28 RCW and makes proper application that includes the person's Social Security number, date of birth, and mailing address. The first certificate issued will expire on the person's birthdate at least one year and not more than three years from the date of issue. If a person was born in an even numbered year, the certificate will expire on the holder's even numbered birthdate. If the person was born in an odd numbered year, the certificate will expire on the holder's odd numbered birthdate. The department will prorate the administrator's certificate fee according to the number of months or major portions of months in a certificate period. All subsequent certificates will be issued for a twenty-four month period.

(2) The department may deny application or renewal of an administrator's certificate if the individual owes outstanding final judgments to the department.

(3) Effective July 1, 1987, an administrator designated on the electrical/telecommunications contractor's license must be a member of the firm who fulfills the duties of a full-time supervisory employee, or be a full-time supervisory employee. In determining whether the person is a member of the firm, the department will require that the person is named as the sole proprietor, a partner or an officer in a corporation as shown on the electrical contractor's license application on

file with the department and the secretary of state. In determining whether a person is a full-time supervisory employee, the department will consider whether the person is on the electrical/telecommunications contractor's full-time payroll; receives a regular salary or wage similar to other employees; has supervisory responsibility for work performed by the electrical/telecommunications contractor and carries out the duties shown in chapter 19.28 RCW.

(4) A firm may designate certain temporary specialty administrator(s) or telecommunications initial specialty

administrator(s) to satisfy the requirements of chapter 19.28 RCW under the guidelines described in Table 950-1 Temporary Specialty Administrator Application/Enforcement Procedure.

(5) The department may deny an application for an administrator's certificate for up to two years if the applicant's previous administrator's certificate has been revoked or suspended for serious noncompliance, as defined in WAC 296-46A-960.

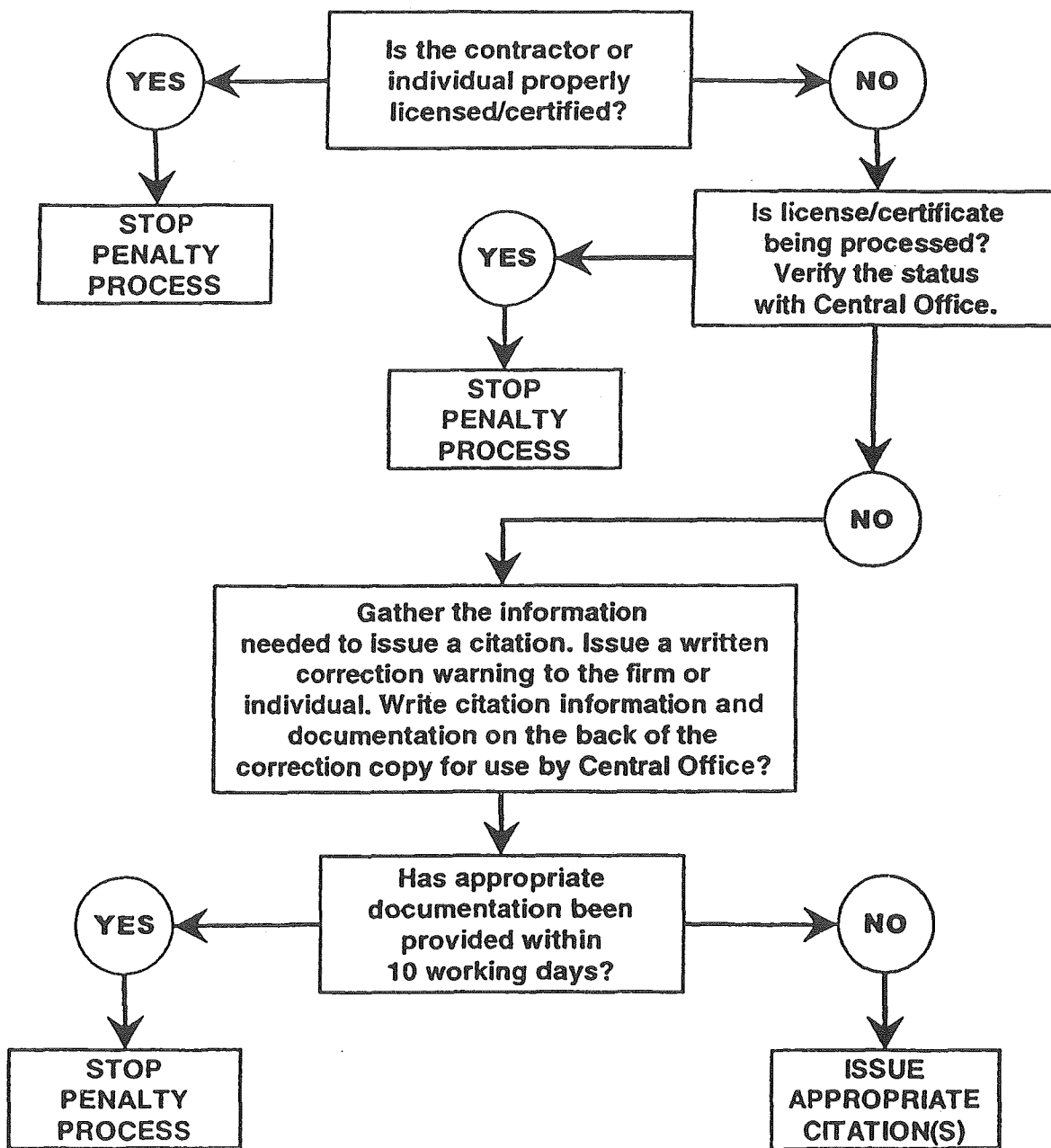
Table 950-1—Temporary Specialty Administrator Application/Enforcement Procedure
SPECIALTIES OPEN FOR CREDIT FOR PREVIOUS WORK EXPERIENCE

ACTION DEADLINES AND DETAILS	HVAC/Refrigeration (06A)	•Domestic well (03A), • Limited energy (06) - (residential sound only), • Nonresidential maintenance (07), • Nonresidential lighting maintenance (07A), • Residential maintenance (New-07B), • Door, window, gate, and similar systems (New-10)	Telecommunications (09) • In business on June 8, 2000 STATUS A • In business after June 8, 2000 STATUS B
Last date to submit application for temporary administrator¹	December 31, 2001 ⁵	December 31, 2001 ⁵	June 30, 2001 ⁵
Required business status in the contracting specialty²	18.27 RCW Contractor Registration or Appropriate Business License	18.27 RCW Contractor Registration or Appropriate Business License	STATUS A—18.27 RCW Contractor Registration STATUS B—Appropriate Business License
Minimum previous experience for firm making temporary designation	N/A	N/A	STATUS A—2 Years ⁶ STATUS B—N/A
Begin interim enforcement⁴	July 1, 2000	July 1, 2001	Effective Date of Chapter 296-46A WAC
Begin full enforcement	January 1, 2002	January 1, 2002	July 1, 2001
Must pass specialty administrator examination no later than:	12 Months After Submitting Temporary Specialty Administrator Application ³	12 Months After Submitting Temporary Specialty Administrator Application ³	STATUS A—N/A ¹ STATUS B—12 Months After Submitting Temporary Specialty Administrator Application ³

Notes:

1. The initial telecommunications designated administrators(s) allowed in RCW 19.28.420(6) is not required to pass an examination.
2. If previous experience is required, it must be full-time in the appropriate specialty.
3. No extension of the temporary specialty administrator's status will be permitted unless the examination is successfully completed and a permanent specialty administrator's certificate is obtained within three months of the examination date. A temporary specialty administrator certificate cannot be renewed or extended.
4. See Figure 1. If a citation is issued for failure to comply with the requirements of chapter 19.28 RCW or WAC 296-46A, the individual/firm will lose the ability to assign a temporary administrator prior to examination.
5. To qualify for a temporary specialty administrator certificate or telecommunications initial designated specialty administrator certificate, the following must be submitted to the department: Complete contractor's application package, complete administrator's application and examination package, complete Transfer of Administrator form, and all appropriate fees.
6. No requirement for the owner of a telecommunications firm described in RCW 19.28.420 (6)(a).

Figure 1
ELECTRICAL SPECIALTY
Interim Licensing/Certification Requirements



[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-950, filed 12/15/00, effective 1/18/01.]

WAC 296-46A-960 Revocation or suspension of an electrical/telecommunications contractor's license or

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administrator's certificate. The department has the ability, in the case of one or more acts of serious noncompliance with the provisions of this chapter, to revoke or suspend for such a period as it determines, any electrical/telecommunications contractor's license or electrical/telecommunications administrator's certificate issued under chapter 19.28 RCW.

Serious noncompliance: Serious noncompliance with the provisions of chapter 19.28 RCW, includes, but is not limited to, the following:

(1) Failure to correct a serious violation. A serious violation is a violation of chapter 19.28 RCW, chapter 296-46A or 296-401B WAC that creates a hazard of fire or a danger to life safety. A serious violation is also a violation that presents imminent danger to the public. Imminent danger to the public is present when installations of wire and equipment that convey electric current have been installed in such a condition that a fire-hazard or a life-safety hazard is present. Imminent danger to the public is also present when unqualified, uncertified, or fraudulently certified electricians or administrators; or unlicensed or fraudulently licensed contractors are continuously or repeatedly performing or supervising the performance of electrical work covered under chapter 19.28 RCW. For the purposes of this section, a certified electrician is considered qualified, provided the electrician is working within his or her certification; or

(2) Submitting a fraudulent document to the department; or

(3) Continuous noncompliance with the provisions of chapter 19.28 RCW, chapter 296-46A or 296-401B WAC. For the purposes of this section, continuous noncompliance will be defined as three or more citations demonstrating a reckless disregard of the electrical law, rules, or regulations within a period of one year; or where it can be otherwise demonstrated that the contractor or administrator has continuously failed to comply with the applicable electrical standards; or

(4) Failure to make any books or records, or certified copies thereof, available to the department for an audit to verify the hours of experience submitted by an electrical trainee; or

(5) A person who knowingly makes a false statement or material misrepresentation on an application, statement of hours, or signed statement required by the department may be referred to the county prosecutor for criminal prosecution under chapter 9A.72 RCW. The department may also file a civil action under chapter 19.28 RCW.

[Statutory Authority: RCW 19.28.031, 19.28.551, 19.28.010, 19.28.101, 19.28.171, 19.28.191, 19.28.251, 19.28.470, 19.28.490, 67.42.050, 2000 c 238, and chapter 19.28 RCW. 01-01-097, § 296-46A-960, filed 12/15/00, effective 1/18/01.]

Chapter 296-49A WAC

DIRECTOR'S FACTORY ASSEMBLED STRUCTURES ADVISORY BOARD

WAC

296-49A-010	What definitions apply to this chapter?
296-49A-020	What is the purpose of these rules?
296-49A-030	What is the purpose of the board?
296-49A-040	Who are the members and officers of the board?
296-49A-050	When does the board meet?
296-49A-060	How are board meetings conducted?
296-49A-070	What are the duties of the board?
296-49A-080	Who can speak at board meetings?
296-49A-090	Can a person appearing before the board solicit business?
296-49A-100	What standards of ethical conduct are expected of board members and persons appearing before the board?
296-49A-110	What statute governs the adoption of FAS rules and regulations?

WAC 296-49A-010 What definitions apply to this chapter? "Board" is the director's factory assembled structures advisory board.

"Department" is the Washington state department of labor and industries.

"Director" is the director of the department of labor and industries.

"Section" is the factory assembled structures (FAS) section of the department.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-010, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-020 What is the purpose of these rules? The primary purpose of these rules is to establish a uniform means of communication between the department and persons, firms or corporations engaged in the manufacture of factory assembled structures. Generally, this communication will involve either proposed WAC rule revisions or the operation of the section.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-020, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-030 What is the purpose of the board? The purpose of the board, as authorized by RCW 43.22.420, is to advise the director on all matters pertaining to the enforcement of chapter 43.22 RCW including but not limited to standards of body and frame design, construction and plumbing, heating and electrical installations, minimum inspection procedures and the adoption of rules and regulations pertaining to the manufacture of factory assembled structures, manufactured (mobile) homes, commercial coaches, recreational vehicles, and recreational park trailers.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-030, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-040 Who are the members and officers of the board? The board has nine members. Each is appointed by the director to a four-year term. The members must represent consumer interests, regulated industries and allied professionals. Consequently, the composition of the board will be:

- Two members representing consumers;
- Two members representing manufactured housing;
- Two members representing factory built structures;
- One member representing recreational vehicles and recreational park trailers;
- One member representing building officials; and
- One member who will either be an architect or an engineer.

The board will elect a chairperson and vice-chairperson. The department's chief prefab building specialist shall serve as secretary of the board.

According to RCW 43.03.050 and 43.03.060, each board member shall be paid travel expenses. Those expenses will be paid out of department appropriations upon the presentation of a voucher approved by the director or the director's designee.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-040, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-050 When does the board meet? The board holds regular quarterly meetings on the third Thursday of February, May, August and November. If needed, the director may call special meetings. Regular and special meetings are open to the public.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-050, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-060 How are board meetings conducted? The board must adopt written rules of procedure governing its internal management. These rules must include *Roberts' Rules of Order, Revised*. Upon written request, copies of these rules of procedure must be provided to all interested persons.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-060, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-070 What are the duties of the board?

(1) Every three years the board must review existing FAS rules and recommend revisions if needed. Also, the board must review any new rules and regulations proposed by the director and make recommendations regarding their adoption.

(2) The board may periodically develop administrative procedures, organizational plans and rules for improving the operation of the section and submit them to the director for consideration.

(3) Upon the request of the director, the board will assist in the administrative interpretation of national codes and Washington state rules and regulations regarding all matters pertaining to the enforcement of chapter 43.22 RCW and the manufacture of factory assembled structures, manufactured (mobile) homes, commercial coaches, recreational vehicles, and recreational park trailers. This interpretative assistance will include but will not be limited to standards of body and frame design, construction and plumbing, heating and electrical installations, and minimum inspection procedures.

However, the board will neither function as a board of appeals nor will it render decisions regarding the application or interpretation of any adopted rule or regulation to any person, firm or corporation engaged in the business of manufacturing factory assembled structures.

(4) At any board meeting, the board must consider any written proposals made by any person, firm or corporation regarding new rules and regulations or changes in administrative procedures related to the section.

However, these written proposals must be submitted to the board's secretary at least fifteen days prior to the meeting so that they can be included on the meeting agenda and in the meeting packet distributed to board members. If the parties submitting these proposals wish to address them at that meeting, their proposals must be accompanied by a written request to address the board.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-070, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-080 Who can speak at board meetings? Any person, firm or corporation can speak at board meetings. However, those persons, firms and corporations

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wishing to formally address the board regarding specific proposals relating to any FAS rule adoptions, amendments or repeals or changes in the section's administrative procedures must be in good ethical standing with the board. (See WAC 296-49A-100.)

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-080, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-090 Can a person appearing before the board solicit business? The board considers it unethical for anyone appearing before the board to use any kind of solicitor to solicit business or to solicit business through circulars, advertisements or by personal communications or interviews unwarranted by personal relations. It is permissible to publish or circulate business cards.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-090, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-100 What standards of ethical conduct are expected of board members and persons appearing before the board? Anyone serving on the board or appearing before it must adhere to the standards described in *"Ethics and the Appearance of Fairness," State of Washington Boards and Commissions Membership Handbook*. Failure to conform to these standards may result in forfeiting the opportunity to either appear before the board or serve as a member.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-100, filed 7/31/97, effective 12/1/97.]

WAC 296-49A-110 What statute governs the adoption of FAS rules and regulations? All FAS rules and regulations will be adopted according to chapter 34.05 RCW, the Administrative Procedure Act.

[Statutory Authority: RCW 43.22.340 and 43.22.420. 97-16-043, § 296-49A-110, filed 7/31/97, effective 12/1/97.]

Chapter 296-52 WAC

SAFETY STANDARDS FOR THE POSSESSION AND HANDLING OF EXPLOSIVES

WAC

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DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER		
296-52-010	Introduction. [Statutory Authority: Chapters 42.30 and 43.22 RCW, RCW 49.17.040, 49.17.050 and 49.17.240. 78-07-052 (Order 78-10), § 296-52-010, filed 6/28/78; Order 70-4, § 296-52-010, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-100
296-52-012	Incorporation of standards of national organizations and federal agencies. [Order 75-41, § 296-52-012, filed 12/19/75.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-110
296-52-020	Purpose. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-020, filed 12/24/81; Order 70-4, § 296-52-020, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-120
296-52-025	Variance and procedure. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-025, filed 12/24/81; Order 75-41, § 296-52-025, filed 12/19/75.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-140
296-52-027	Equipment approval by nonstate agency or organization. [Order 75-41, § 296-52-027, filed 12/19/75.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-150
296-52-030	Definitions. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-52-030, filed 12/11/84; 81-07-048 (Order 81-4), § 296-52-030, filed 3/17/81; Order 75-41, § 296-52-030, filed 12/19/75; Order 70-4, § 296-52-030, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-160
296-52-040	User's (blaster's) license. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-52-040, filed 12/11/84; 82-02-003 (Order 81-32), § 296-52-040, filed 12/24/81; Order 70-4, § 296-52-040, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-165
296-52-043	Use of explosives and blasting agents. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-52-043, filed 12/11/84; 82-08-026 (Order 82-10), § 296-52-043, filed 3/30/82; 81-07-048 (Order 81-4), § 296-52-043, filed 3/17/81; Order 76-6, § 296-52-043, filed 3/1/76; Order 75-41, § 296-52-043, filed 12/19/75.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-52-170
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5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-180 Storage magazine license fees. [Order 70-4, § 296-52-180, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-190 Dealer's license. [Order 76-6, § 296-52-190, filed 3/1/76; Order 70-4, § 296-52-190, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-200 Annual inspection. [Order 70-4, § 296-52-200, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-220 Purchaser's license. [Order 70-4, § 296-52-220, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-230 Unlawful access to explosives. [Order 70-4, § 296-52-230, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-260 Coal mining code unaffected. [Order 70-4, § 296-52-260, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-270 Shipments out-of-state. [Order 70-4, § 296-52-270, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-330 Explosives containers to be marked—Penalty. [Order 70-4, § 296-52-330, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-350 Small arms ammunition, primers, and propellants—Transportation regulations. [Order 70-4, § 296-52-350, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-360 Small arms ammunition, primers, and propellants—Separation from flammable materials. [Order 70-4, § 296-52-360, filed 4/29/70.] Repealed by 86-10-4 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-370 Smokeless propellants and black powder, transportation, storage and display requirements. [Order 76-6, § 296-52-370, filed 3/1/76; Order 70-4, § 296-52-370, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-380 Small arms ammunition primers, transportation, storage, and display requirements. [Order 76-6, § 296-52-380, filed 3/1/76; Order 70-4, § 296-52-380, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-390 Storage of ammonium nitrate. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-390, filed 12/24/81; Order 76-6, § 296-52-390, filed 3/1/76; Order 75-41, § 296-52-390, filed 12/19/75; Order 70-4, § 296-52-390, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-400 Enforcement. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-52-400, filed 12/11/84; Order 70-4, § 296-52-400, filed 4/29/70.] Repealed by 86-10-044 (Order 86-24), filed 5/6/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-473 Quantity and distance tables for storage. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-473, filed 5/6/86.] Repealed by 90-03-029 (Order 89-20), filed 1/1/90, effective 2/26/90. Statutory Authority: Chapter 49.17 RCW.

296-52-9001 Appendix Figure 1—Application for user's (blaster's) license. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-9001, filed 12/24/81; Order 75-41, Appendix Figure 1 (codified as WAC 296-52-9001), filed 12/19/75; Order 70-4, Appendix Figure 1, filed 4/29/70.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-9002 Appendix Figure 2—Request for inspection. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003

(Order 81-32), § 296-52-9002, filed 12/24/81; Order 70-4, Appendix Figure 2 (codified as WAC 296-52-9002), filed 4/29/70.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-9003 Appendix Figure 3—Application for license to manufacture explosives. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-9003, filed 12/24/81; Order 70-4, Appendix Figure 3 (codified as WAC 296-52-9003), filed 4/29/70.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-9004 Appendix Figure 4—Application for license to operate a storage magazine for explosives. [Order 75-41, Appendix Figure 4 (codified as WAC 296-52-9004), filed 12/19/75; Order 70-4, Appendix Figure 4, filed 4/29/70.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-9005 Appendix Figure 5—Application for dealer's license. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-9005, filed 12/24/81; Order 70-4, Appendix Figure 5 (codified as WAC 296-52-9005), filed 4/29/70.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-9006 Appendix Figure 6—Application for license to purchase explosives. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-9006, filed 12/24/81; Order 75-41, Appendix Figure 6 (codified as WAC 296-52-9006), filed 12/19/75; Order 70-4, Appendix Figure 6, filed 4/29/70.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.

296-52-9007 Appendix Figure 7—Dealer's record. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-02-003 (Order 81-32), § 296-52-9007, filed 12/24/81; Order 70-4, Appendix Figure 7 (codified as WAC 296-52-9007), filed 4/29/70.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.

PART A—GENERAL

WAC 296-52-401 Scope and application. (1) This chapter is adopted pursuant to the State Explosives Act, RCW 70.74.020, in accordance with chapter 34.05 RCW, the Administrative Procedure Act, and chapter 49.17 RCW, the Washington Industrial Safety and Health Act.

(2) This chapter shall be identified as chapter 296-52 WAC, "safety standards for possession, handling and use of explosives" and hereafter be called the "explosive code."

(3) This chapter shall apply to:

(a) All aspects of manufacture, possession, storage, selling, purchase, transportation, and the use of explosives or blasting agents as defined in this chapter.

(b) Any person, partnership, company, corporation, or other entity, including governmental agencies, except:

(i) Storage, handling, and use of (noncommercial) military explosives while under the control of the United States Government and/or United States Military authorities.

(ii) Those instances and actions identified by RCW 70.74.191, "Exemptions."

(4) Fireworks regulations.

(a) "Common fireworks" classified as Class C explosives (International Designation 1.4) by the U.S. Department of Transportation shall be exempt from all requirements of this chapter. Common fireworks are subject to the requirements of chapter 70.77 RCW, State fireworks law, and chapter 212-17 WAC, fireworks regulations administered by the state department of community trade and economic development, fire protection services division.

(b) Fireworks classified as Class A or Class B explosives, (International Designation 1.1, 1.2 or 1.3) shall be subject to the storage (only) requirements of this chapter and shall be stored in magazines licensed by the department of labor and industries when unattended.

Note: Fire protection services division administers requirements of the Uniform Fire Code and Uniform Building Code for Class C common fireworks storage.

(5) The manufacture of explosives or pyrotechnics, as defined in this chapter, shall comply with the requirements of chapter 296-67 WAC, Safety standards for process safety management of highly hazardous chemicals.

(6) The enforcing authority of this chapter, the department of labor and industries, recognizes the obligation of other law enforcement agencies to enforce specific aspects or sections of chapter 70.74 RCW, the State Explosives Act, under local ordinance and with joint and shared authority as granted by RCW 70.74.201. The department of labor and industries shall cooperate with all other law enforcement agencies in carrying out the intent of the explosive code and the State Explosives Act.

(7) In all activities governed by the State Explosives Act, chapter 70.74 RCW, the director shall administer this chapter with the full resources of the department of labor and industries. Where materials classified by this chapter as explosives or blasting agents may be found or where the director has reasonable cause to expect they exist, administration of this chapter shall include the right of entry for inspection purposes into any location, facility, or equipment at any such times as the director or his designated representative deems appropriate and to issue penalty sanctions for all instances found not to be in compliance with the requirements of this chapter.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-401, filed 3/6/95, effective 4/20/95; 92-17-022 (Order 92-06), § 296-52-401, filed 8/10/92, effective 9/10/92; 88-23-054 (Order 88-25), § 296-52-401, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-401, filed 5/6/86.]

WAC 296-52-405 Incorporation of standards of national organizations and federal agencies. (1) Whenever a provision of this chapter incorporates by reference a national code or portion thereof which has been adopted by and is currently administered by another state agency, compliance with those provisions adopted and administered by such other state agency, if from a more recent edition of such national code, will be deemed to be prima facie evidence of compliance with the provisions of this chapter.

(2) Whenever a provision of this chapter incorporates therein provisions of the Code of Federal Regulations (CFR) or any other regulations adopted by an agency of the federal government, that provision of this chapter shall be construed to mean that compliance with such regulations shall be prima facie evidence of compliance with the provisions of this chapter.

(3) Whenever a provision of this chapter incorporates therein provisions of the Code of Federal Regulations, the provisions so incorporated shall be those in effect on the date of effectiveness of this chapter, unless the content of the incorporating section specifies otherwise.

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[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-405, filed 5/6/86.]

WAC 296-52-409 Variance and procedure. Realizing that conditions may exist in operations under which certain state standards will not have practical application, the director of the department of labor and industries or his authorized representative may, pursuant to this section, RCW 49.17.080 and/or 49.17.090 and appropriate administrative rules of this state and the department of labor and industries and upon receipt of application and after adequate investigation by the department, permit a variation from these requirements when other means of providing an equivalent measure of protection are afforded. Such variation granted shall be limited to the particular case or cases covered in the application for variance and may be revoked for cause. The permit for variance shall be conspicuously posted on the premises and shall remain posted during the time it is in effect. All requests for variances from safety and health standards included in this or any other chapter of Title 296 WAC, shall be made in writing to the director of the department of labor and industries at Olympia, Washington, or his/her duly authorized representative, the assistant director, division of consultation and compliance, department of labor and industries, Olympia, Washington. Variance application forms may be obtained from the department upon request.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-409, filed 3/6/95, effective 4/20/95. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-409, filed 5/6/86.]

WAC 296-52-413 Equipment approval by nonstate agency or organization. Whenever a provision of this chapter states that only that equipment or those processes approved by an agency or organization other than the department of labor and industries, such as the Underwriters Laboratories, Mine Safety and Health Administration or the National Institute for Occupational Safety and Health, shall be construed to mean that approval of such equipment or process by the designated agency or group shall be prima facie evidence of compliance with the provision of this chapter.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-413, filed 3/6/95, effective 4/20/95. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-413, filed 5/6/86.]

WAC 296-52-417 Definitions. Definitions as used in this chapter, unless a different meaning is plainly required by the context:

"American Table of Distances" means American Table of Distances for Storage of Explosives as revised and approved by the Institute of the Makers of Explosives.

"Approved storage facility" means a facility for the storage of explosive materials conforming to the requirements of this part and covered by a license or permit issued under authority of the department of labor and industries. (See WAC 296-52-441.)

"Attend" means the physical presence of an authorized person within the field of vision of explosives. The said attendant shall be awake, alert and not engaged in activities which may divert attention so that in case of an emergency the attendant can get to the explosives quickly and without interfer-

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ence, except for brief periods of necessary absence, during which absence simple theft of explosives is not ordinarily possible.

"Authorized," "approved" or "approval" means authorized, approved, or approval by the department of labor and industries or other approving agency or individual as specified by the provisions of this chapter.

"Authorized person" means a person approved or assigned by the employer, owner, or licensee to perform a specific type of duty or duties or to be at a specific location or locations at the jobsite.

"Barricaded" means the effective screening of a building containing explosives from a magazine or other building, railway, or highway by a natural or an artificial barrier. A straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine or other building or to a point twelve feet above the center of a railway or highway shall pass through such barrier.

"Blast area" means the area of a blast within the influence of flying rock missiles, gases, and concussion.

"Blast pattern" means the plan of the drill holes laid out on a bench; an expression of the burden distance and the spacing distance and their relationship to each other.

"Blast site" means the area where explosive material is handled during loading, including the perimeter of blast holes and 50 feet in all directions from loaded holes or holes to be loaded. In underground mines 15 feet of solid rib or pillar can be substituted for the 50 foot distance.

"Blaster" means that qualified person in charge of and responsible for the loading and firing of a blast.

"Blaster in charge" shall mean a licensed blaster who is fully qualified in the blasting process to be used including all aspects of storage, handling and use as recommended by the manufacturer and as required by this chapter. He/she shall be adequately trained and experienced as to be capable of recognizing hazardous conditions throughout the blast site and has the authority to take prompt corrective action.

"Blasting agent" means any material or mixture consisting of a fuel and oxidizer, intended for blasting, not otherwise classified as an explosive, and in which none of the ingredients are classified as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated when unconfined by means of a No. 8 test blasting cap.

"Blockholing" means the breaking of boulders by firing a charge of explosives that has been loaded in a drill hole.

"Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to personnel or property, and who has authorization to take prompt corrective action to eliminate them.

"Conveyance" means any unit for transporting explosives or blasting agents, including but not limited to trucks, trailers, rail cars, barges, and vessels.

"Day box" means a box which is not approved as a magazine for unattended storage of explosives. Such box may be used for storage of explosives during working hours on a job site, provided that it shall always be guarded against theft, particularly in inhabited areas, and shall be attended or locked and secured against outright lifting, as the risk

demands. Caps shall be safely separated from other explosives. Such day boxes shall be marked with the word "explosives" and be constructed in accordance with WAC 296-52-453(7).

"Dealer" means any person who purchases explosives or blasting agents for the sole purpose of resale, and not for use or consumption.

"Department" means the department of labor and industries.

"Detonating cord" means a round, flexible cord containing a center core of high explosive and used to initiate other explosives.

"Detonator" means any device containing any initiating or primary explosive that is used for initiating detonation. The term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses, detonating cord delay connectors, and nonelectric instantaneous and delay blasting caps which use detonating cord, shock tube, or any other replacement for electric leg wires.

"Director" means the director of the department of labor and industries, or the designated representative.

"Efficient artificial barricade" means an artificial mound or properly revetted wall of earth of a minimum thickness of not less than three feet or such other artificial barricade as approved by the department of labor and industries.

"Electric blasting cap" means a blasting detonator designed for and capable of detonation by means of an electric current.

"Electric blasting circuitry" means:

- Bus wire. An expendable wire, used in parallel or series, in parallel circuits, to which are connected the leg wires of electric blasting caps.

- Connecting wire. An insulated expendable wire used between electric blasting caps and the leading wires or between the bus wire and the leading wires.

- Leading wire. An insulated wire used between the electric power source and the electric blasting cap circuit.

- Permanent blasting wire. A permanently mounted insulated wire used between the electric power source and the electric blasting cap circuit.

"Electric delay blasting caps" means caps designed to detonate at a predetermined period of time after energy is applied to the ignition system.

"Emulsion" means an explosive material containing substantial amounts of oxidizer dissolved in water droplets, surrounded by an immiscible fuel, or droplets of an immiscible fuel surrounded by water containing substantial amounts of oxidizer.

"Explosive" or "explosives" whenever used in this chapter means any chemical compound or mechanical mixture that is commonly used or intended for the purpose of producing an explosion, that contains any oxidizing and combustible units, or other ingredients, in such proportions, quantities or packing, that an ignition by fire, by friction, by concussion, by percussion, or by detonation of any part of the compound or mixture may cause such a sudden generation of highly heated gases that the resultant gaseous pressures are capable of producing destructive effects on contiguous objects or of destroying life or limb. In addition, the term "explosives"

shall include all material which is classified as Class A, Class B, and Class C explosives by the federal Department of Transportation. For the purposes of this chapter small arms ammunition, small arms ammunition primers, smokeless powder not exceeding fifty pounds, and black powder not exceeding five pounds shall not be defined as explosives unless possessed or used for a purpose inconsistent with small arms use or other lawful purpose.

Note 1: As excerpted from RCW 70.74.010(4), classification of explosives shall include but not be limited to the following:

- (a) Class A explosives: (Possessing detonating hazard) dynamite, nitroglycerin, picric acid, lead azide, fulminate of mercury, black powder exceeding five pounds, blasting caps in quantities of 1001 or more, and detonating primers.
- (b) Class B explosives: (Possessing flammable hazard) propellant explosives, including smokeless propellants exceeding fifty pounds.
- (c) Class C explosives: (Including certain types of manufactured articles which contain Class A or Class B explosives, or both, as components but in restricted quantities) blasting caps in quantities of 1000 or less.

Note 2: Under the authority of RCW 70.74.020(3), the department of labor and industries will accept federal (U.S. Department of Transportation and/or Bureau of Alcohol, Tobacco and Firearms) international identification marking on explosives and/or explosives containers or packaging in lieu of Washington state designated marking as defined in RCW 70.74.010 (Class A, B or C) and required by RCW 70.74.300. See Appendix III, WAC 296-52-555.

"Explosive-actuated power devices" means any tool or special mechanized device which is actuated by explosives, but not to include propellant-actuated power devices.

"Explosives manufacturing building" means any building or other structure (excepting magazines) containing explosives, in which the manufacture of explosives, or any processing involving explosives, is carried on, and any building where explosives are used as a component part or ingredient in the manufacture of any article or device.

"Explosives manufacturing plant" means all lands, with the buildings situated thereon, used in connection with the manufacturing or processing of explosives or in which any process involving explosives is carried on, or the storage of explosives thereat, as well as any premises where explosives are used as a component part or ingredient in the manufacture of any article or device.

"Factory building" means the same as "manufacturing building."

"Forbidden or not acceptable explosives" means explosives which are forbidden or not acceptable for transportation by common carriers by rail freight, rail express, highway, or water in accordance with the regulations of the federal Department of Transportation.

"Fuel" means a substance which may react with oxygen to produce combustion.

"Fuse (safety)" means a flexible cord containing an internal burning medium by which fire or flame is conveyed at a continuous and uniform rate from the point of ignition to the point of use, usually a fuse detonator.

"Fuse cap (fuse detonator)" means a detonator which is initiated by a safety fuse; also referred to as an ordinary blasting cap.

"Fuse lighters" means special devices for the purpose of igniting safety fuse.

"Handler" means any person/individual who handles explosives for purposes of transporting, moving, or assisting a licensed user (blaster) in loading, firing, blasting, or disposing of explosives and blasting agents. This does not include employees of a licensed manufacturer engaged in manufacturing process, drivers of common carriers or contract haulers.

"Handloader" means any person who engages in the non-commercial assembling of small arms ammunition for personal use, specifically the operation of installing new primers, powder, and projectiles into cartridge cases.

"Handloader components" means small arms ammunition, small arms ammunition primers, smokeless powder not exceeding fifty pounds, and black powder as used in muzzle loading firearms not exceeding five pounds.

"Highway" shall mean and include any public street, public alley, or public road.

"Improvised device" means a device which is fabricated with explosives or destructive, lethal, noxious, pyrotechnic, or incendiary chemicals and which is designed to disfigure, destroy, distract, or harass.

"Inhabited building" means only a building regularly occupied in whole or in part as a habitation for human beings, or any church, schoolhouse, railroad station, store, or other building where people are accustomed to assemble, other than any building or structure occupied in connection with the manufacture, transportation, storage, or use of explosives.

"Low explosives" means explosive materials which can be caused to deflagrate when confined, (for example, black powder, safety fuses, igniters, igniter cords, fuse lighters, and "special fireworks" defined as Class B explosives by U.S. Department of Transportation regulations in 49 CFR Part 173, except for bulk salutes).

"Magazine" means any building, structure or container, other than an explosive manufacturing building, approved for the storage of explosive materials.

"Manufacturer" means any person engaged in the business of manufacturing explosive materials for purposes of sale, distribution, or use, provided that the term manufacturing shall not include inserting a detonator into a cast booster or a stick of high explosive product to make a primer for loading into a blasthole. The term manufacturer also shall not include nor be applicable to the act of on-blast site mixing, either by hand or by mechanical apparatus, binary components, ammonium nitrate and fuel oil and/or emulsion products to create explosives for immediate down-blasthole delivery. This defined exclusion is limited to materials and components which are not classified by U.S. DOT as explosives until after they are mixed.

"Misfire" means the complete or partial failure of an explosive charge to explode as planned.

"Motor vehicle" means any self-propelled automobile, truck, tractor, semitrailer or full trailer, or other conveyance used for the transportation of freight.

"Mudcap" means covering the required number of cartridges that have been laid on top of a boulder with a three or four inch layer of mud (free from rocks or other material which might constitute a missile hazard). Mudcapping is also commonly known as "bulldozing" and "dobyng."

"Natural barricade" means any natural hill, mound, wall, or barrier composed of earth or rock or other solid material of a minimum thickness of not less than three feet. With site specific department approval, an acceptable natural barricade may be a stand of mature timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare of leaves.

"Nonelectric delay blasting cap" means a blasting cap with an integral delay element in conjunction with and capable of being detonated by a detonation impulse or signal from miniaturized detonating cord or shock tube.

"Oxidizer" means a substance that yields oxygen readily to stimulate the combustion of organic matter or other fuel.

"Permanent magazines" means magazines that are permanently fastened to a foundation and that are left unattended. The capacity of said permanent magazines shall not exceed the limits stated in RCW 70.74.040. Permanent magazines shall be approved and licensed.

"Person" means any individual, firm, copartnership, corporation, company, association, joint stock association, and including any trustee, receiver, assignee, or personal representative thereof.

"Person responsible," for an explosives magazine, means the legal person who actually operates the magazine and who is responsible for the proper storage, protection and removal of the explosives. The responsible person may be the owner or the lessee or the authorized operator of the magazine.

"Portable magazines" also called "field" magazines means magazines that are designed to be unattended and that are not permanently fastened to a foundation. Said magazines shall be so constructed or secured that they can not be readily lifted and carried away by unauthorized persons. The capacity of said portable magazines shall be limited to the amount of explosives required for efficient operation. Portable magazines shall be approved and licensed.

"Possess" means the physical possession of explosives in one's hand, vehicle, magazine or building.

"Primary blasting" means the blasting operation by which the original rock formation is dislodged from its natural location.

"Primer" means a unit, package, cartridge, or container of explosives into which a detonator or detonating cord is inserted or attached to initiate other explosives or blasting agents.

"Propellant-actuated power device" means any tool or special mechanized device or gas generator system which is actuated by a propellant or which releases and directs work through a propellant charge.

"Public conveyance" means any railroad car, streetcar, ferry, cab, bus, airplane, or other vehicle which is carrying passengers for hire.

"Public utility transmission system" means power transmission lines over 10 kV, telephone cables, or microwave transmission systems, or buried or exposed pipelines carrying water, natural gas, petroleum, or crude oil, or refined products and chemicals, whose services are regulated by the utilities and transportation commission, municipal, or other publicly owned systems.

"Purchaser" means any person who buys, accepts, or receives any explosives or blasting agents.

"Pyrotechnics" means any combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible effects which are commonly referred to as fireworks.

"Qualified person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.

"Railroad" means any steam, electric, or other railroad which carries passengers for hire.

"Railroad freight car" means cars that are built for and loaded with explosives and operated in accordance with DOT rules.

"Safety fuse" means a flexible cord containing an internal burning medium by which fire is conveyed at a continuous and uniform rate for the purpose of firing blasting caps.

"Secondary blasting" means the reduction of oversize material by the use of explosives to the dimension required for handling, including muddapping and blockholing.

"Semiconductive hose" means a hose with an electrical resistance high enough to limit flow of stray electric currents to safe levels, yet not so high as to prevent drainage of static electric charges to ground; hose of not more than 2 megohms resistance over its entire length and of not less than 5,000 ohms per foot meets the requirement.

"Shall" means that the rule establishes a minimum standard which is mandatory.

"Shock tube" means a small diameter plastic tube for initiating detonators. It contains a limited amount of reactive material so that the energy that is transmitted through the tube by means of a detonation wave is guided through and confined within the walls of the tube.

"Should" means recommended.

"Small arms ammunition" means any shotgun, rifle, pistol, or revolver cartridge, and cartridges for propellant-actuated power devices and industrial guns. Military-type ammunition containing explosive bursting charges, incendiary, tracer, spotting, or pyrotechnic projectiles is excluded from this definition.

"Small arms ammunition primers" means small percussion-sensitive explosive charges encased in a cap or capsule and used to ignite propellant powder and shall include percussion caps as used in muzzle loaders.

"Smokeless propellants" means solid chemicals or solid chemical mixtures in excess of fifty pounds which function by rapid combustion.

"Special industrial explosive devices" means explosive-actuated power devices and propellant-actuated power devices.

"Special industrial explosives materials" means shaped materials and sheet forms and various other extrusions, pellets, and packages of high explosives, which include dynamite, trinitrotoluene (TNT), pentaerythritol tetranitrate (PETN), hexahydro-1, 3, 5-trinitro-s-triazine (RDX), and other similar compounds used for high-energy-rate forming, expanding, and shaping in metal fabrication, and for dismemberment and quick reduction of scrap metal.

"Springing" means the creation of a pocket in the bottom of a drill hole by the use of a moderate quantity of explosives in order that larger quantities or explosives may be inserted therein.

"Sprung holes" means to spring or chamber the bottom of the drilled hole to allow room for additional explosives as a bottom load.

"Stemming" means a suitable inert incombustible material or device used to confine or separate explosives in a drill hole, or to cover explosives in mudcapping.

"Trailer" means semitrailers or full trailers as defined by DOT, that are built for and loaded with explosives and operated in accordance with DOT rules.

"User" means any natural person, manufacturer, or blaster who acquires, purchases, or uses explosives as an ultimate consumer or who supervises such use.

"Water gels or slurry explosives" comprise a wide variety of materials used for blasting. They all contain substantial proportions of water and high proportions of ammonium nitrate, some of which is in solution in the water. Two broad classes of water gels are:

- Those which are sensitized by a material classed as an explosive, such as TNT or smokeless powder,
- Those which contain no ingredient classified as an explosive; these are sensitized with metals such as aluminum or with other fuels. Water gels may be premixed at an explosives plant or mixed at the site immediately before delivery into the bore hole.

"DOT specification" are regulations of the Department of Transportation published in 49 CFR Chapter I.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-417, filed 3/6/95, effective 4/20/95; 91-03-044 (Order 90-18), § 296-52-417, filed 1/10/91, effective 2/12/91; 90-03-029 (Order 89-20), § 296-52-417, filed 1/11/90, effective 2/26/90. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-417, filed 5/6/86.]

PART B—EXPLOSIVES LICENSING

WAC 296-52-419 Basic legal obligations. (1) It is unlawful for any person to manufacture, purchase, sell, offer for sale, use, possess, transport, or store any explosive improvised device, or components that are intended to be assembled into an explosive or improvised device without having a validly issued license from the department of labor and industries which license has not been revoked or suspended. Violation of this section is a Class C felony.

(2) Upon notice from the department of labor and industries or any law enforcement agency having jurisdiction, a person manufacturing, purchasing, selling, offering for sale, using, possessing, transporting, or storing any explosives, improvised device, or components of explosives or improvised devices without a license shall immediately surrender those explosives, improvised devices, or components to the department or to the respective law enforcement agency.

(3) At any time that the director of labor and industries requests the surrender of explosives, improvised devices, or components of explosives or improvised devices from any person pursuant to subsection (2) of this section, the director may in addition request the attorney general to make application to the superior court of the county in which the unlawful

practice exists for a temporary restraining order or such other relief as appears to be appropriate under the circumstances.

(4) Miscellaneous provisions - general hazard. No person shall store, handle, or transport explosives or blasting agents when such storage, handling, and transportation of explosives or blasting agents constitutes an undue hazard to life.

(5) No person, except the director of labor and industries or the director's authorized agent, the owner, the owner's agent, or a person authorized to enter by the owner or owner's agent, or a law enforcement officer acting within his or her official capacity, may enter any explosives manufacturing building, magazine or car, vehicle or other common carrier containing explosives in this state. Violation of this section is a gross misdemeanor punishable under chapter 9A.20 RCW.

(6) Unless otherwise allowed to do so under this chapter, a person who exhibits a device designed, assembled, fabricated, or manufactured, to convey the appearance of an explosive or improvised device, and who intends to, and does, intimidate or harass a person, is guilty of a Class C felony.

(7) Discharge of firearms or igniting flame near explosives.

(a) No person shall discharge any firearms at or against any magazine or explosives manufacturing buildings or ignite any flame or flame-producing device nearer than fifty feet from said magazine or explosives manufacturing building.

(b) No person shall discharge a firearm at a magazine or at explosive material.

(8) Every person who maliciously places any explosive or improvised device in, upon, under, against, or near any building, car, vessel, railroad track, airplane, public utility transmission system, or structure, in such a manner or under such circumstances as to destroy or injure it if exploded, shall be punished as follows:

(a) If the circumstances or surroundings are such that the safety of any person might be endangered by the explosion, by imprisonment in a state correctional facility for not more than twenty years.

(b) In every other case by imprisonment in a state correctional facility for not more than five years.

(9) It shall be unlawful for any person to abandon explosives or improvised devices. Violation of this section is a gross misdemeanor punishable under chapter 9A.20 RCW.

(10) If any provision of this act or its application to any person or circumstance is held invalid, the remainder of the act or the application of the provisions to other persons or circumstances is not affected.

(11) This chapter shall not preclude local jurisdictions such as city or county government, or other government authorities such as the Washington utilities and transportation commission or Washington state patrol from adopting and administering local ordinances or Washington Administrative Code regulations relating to explosives. Said rules and regulations however shall not diminish or replace any regulation of this chapter which will be administered by the director of labor and industries in all applications where explosives are stored, kept or had, without regard for employer-employee relationship.

[Statutory Authority: Chapter 49.17 RCW, 95-07-014, § 296-52-419, filed 3/6/95, effective 4/20/95; 90-03-029 (Order 89-20), § 296-52-419, filed 1/11/90, effective 2/26/90; 88-23-054 (Order 88-25), § 296-52-419, filed 11/14/88.]

WAC 296-52-421 Licenses—Information verification. (1) Any information request by the department, in order to verify statements in an application or in order to facilitate a department inquiry, shall be supplied prior to the issuance or renewal of a license. A Social Security number is required at the time of application (RCW 26.23.150).

(2) The director of labor and industries shall require, as a condition precedent to the original issuance or renewal of any explosive license, fingerprinting and criminal history record information checks of every applicant.

(a) In the case of a corporation, fingerprinting and criminal history record information checks shall be required for the management officials directly responsible for the operations where the explosives are used if such persons have not previously had their fingerprints recorded with the department of labor and industries.

(b) In the case of a partnership, fingerprinting and criminal history record information checks shall be required of all general partners.

(c) Such fingerprints as are required by the department of labor and industries shall be submitted on forms provided by the department to the identification section of the Washington state patrol and to the identification division of the Federal Bureau of Investigation in order that these agencies may search their records for prior convictions of the individuals fingerprinted.

(d) The Washington state patrol shall provide to the director of labor and industries such criminal record information as the director may request.

(e) The applicant shall give full cooperation to the department of labor and industries and shall assist the department of labor and industries in all aspects of fingerprinting and criminal history record information check.

(f) The applicant may be required to pay a fee not to exceed twenty dollars to the agency that performs the fingerprinting and criminal history process.

(3) The director of labor and industries shall not issue a license to manufacture, purchase, store, use, or deal with explosives to:

(a) Any persons under twenty-one years of age;

(b) Any person whose license is suspended or whose license has been revoked, except as provided in WAC 296-52-423;

(c) Any person who has been convicted in this state or elsewhere of a violent offense as defined in RCW 9.94A.030, perjury, false swearing, or bomb threats or a crime involving a schedule I or II controlled substance, or any other drug or alcohol related offenses, unless such other drug or alcohol related offense does not reflect a drug or alcohol dependency.

Exception: The director of labor and industries may issue a license if the person suffering a drug or alcohol related dependency is participating in or has completed an alcohol or drug recovery program acceptable to the department of labor and industries and has established control of their alcohol or drug dependency. The director of labor and industries shall require the applicant to provide proof of such participation and control.

(d) Any person who has previously been adjudged to be mentally ill or insane, or to be incompetent due to any mental disability or disease and who has not at the time of application been restored to competency.

(e) The department shall not issue or reissue an explosives license to any individual who is physically handicapped or diseased to an extent that he or she cannot safely pursue or continue all normal aspects of an explosives occupation. Disqualifying physical imparities may include but are not limited to examples such as blindness, deafness, or subject to epileptic or diabetic seizures or coma.

(f) A license holder of any unexpired license(s) shall surrender such license(s) to the department upon request for identified cause. Such surrender is subject to appeal to refute the contention of cause with verification of physical ability by a qualified physician.

Note: See also WAC 296-52-425 and 296-52-433.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-17-094, § 296-52-421, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW, 95-07-014, § 296-52-421, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-421, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-10-044 (Order 86-24), § 296-52-421, filed 5/6/86.]

WAC 296-52-423 Revoking or suspending licenses.

(1) The department of labor and industries shall revoke and not renew the license of any person holding a manufacturer, dealer, purchaser, user, or storage license upon conviction of any of the following offenses, which conviction has become final:

(a) A violent offense as defined in RCW 9.94A.030;

(b) A crime involving perjury or false swearing, including the making of a false affidavit or statement under oath to the department of labor and industries in an application or report made pursuant to this title;

(c) A crime involving bomb threats;

(d) A crime involving a schedule I or II controlled substance, or any other drug or alcohol related offense, unless such other drug or alcohol related offense does not reflect a drug or alcohol dependency.

Conditional exception: The department of labor and industries may issue a conditional renewal of the license to any convicted person suffering a drug or alcohol dependency who is participating in an alcoholism or drug recovery program acceptable to the department of labor and industries and has established control of their alcohol or drug dependency. The department of labor and industries shall require the applicant to provide proof of such participation and control.

(e) A crime relating to possession, use, transfer, or sale of explosives under this chapter or any other chapter of the Revised Code of Washington.

(2) The department of labor and industries shall revoke the license of any person adjudged to be mentally ill or insane, or to be incompetent due to any mental disability or disease. The director shall not renew the license until the person has been restored to competency.

(3) The department of labor and industries is authorized to suspend, for a period of time not to exceed six months, the license of any person who has violated this chapter or the rules promulgated pursuant to this chapter.

(4) The department of labor and industries may revoke the license of any person who has repeatedly violated this chapter or the rules promulgated pursuant to this chapter, or who has twice had his or her license suspended under this chapter.

(5) Upon receipt of notification by the department of labor and industries of revocation or suspension, a licensee must surrender immediately to the department any or all such licenses revoked or suspended. License fees will not be refunded for any licenses which are revoked for cause.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-423, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-423, filed 11/14/88.]

WAC 296-52-425 Dealer's license. (RCW 70.74.130 and 70.74.230, apply.)

(1) The application for a dealer's license to buy explosives for the sole purpose of resale shall be made to Department of Labor and Industries, Olympia.

(2) Original license applications and/or application for renewal shall be completed on forms available from the department and shall comply with all requirements of WAC 296-52-421. The license fee shall be twenty-five dollars.

(3) The license shall be renewed annually, no later than the expiration date.

(4) When an order for explosives is placed in person, by telephone, or in writing by a purchaser, the seller shall request proper authorization and identification from the purchaser and shall record the purchaser's license number.

(5) A dealer shall not distribute explosive materials to a company or individual on the order of a person who does not appear on the up to date list of representatives or agents and if the person does appear on the list, the dealer shall verify the identity of such person.

Exception: The above regulation(s) shall not apply to licensed common carrier companies when said common carrier is not purchasing the explosives but is merely transferring the materials from the seller to the purchaser and the transfer practices comply with current state and federal DOT regulations.

(6) Dealers records.

(a) A dealer's record of all explosives purchased and sold as defined in RCW 70.74.010, shall be kept on file and a copy transmitted not later than the tenth of every month to the department.

(b) The purchaser's name and license number shall be stated on dealer's record, and the name of the person authorized by the purchaser to physically receive the explosives.

(c) The dealer shall ascertain the identity of the individual who receives the explosives from a picture-type identification card, such as a driver's license. The recipient shall sign a receipt, documenting the explosives received and said receipt shall be retained by the dealer for not less than one year from the date of purchase.

(7) Any package, cask, or can containing any explosive, nitroglycerin, dynamite, or powder that is put up for sale, or is delivered to any warehouseman, dock, depot, or common carrier shall be properly labeled thereon to indicate its explosive classification.

(8) If the explosives are delivered by the dealer or dealer's authorized agent to an explosives magazine, the license number of said magazine and the legal signature of

the recipient, properly authorized and identified, shall be obtained.

(9) No person shall sell, display, or expose for sale any explosive, improvised device or blasting agent on any highway, street, sidewalk, public way, or public place.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-425, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-425, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-425, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-425, filed 5/6/86.]

WAC 296-52-429 License for manufacturing. RCW 70.74.110 and 70.74.144, apply.

(1) No person, partnership, firm, company or corporation shall manufacture explosives or blasting agents or use any process involving explosives as a component part in the manufacture of any device, article or product without first obtaining a manufacturer's license from the department of labor and industries.

(2) The application for license for manufacturing explosives and/or blasting agents shall be made to Department of Labor and Industries, Division of Consultation and Compliance, Olympia. The license fee for either an original license or a renewal shall be twenty-five dollars.

(3) The application for original license or renewal shall be completed on forms available from the department and shall provide the following information:

(a) Location of place of manufacture or processing;

(b) Kind of explosives manufactured, processed, or used;

(c) The distance that such explosives manufacturing building is located or intended to be located from the other factory buildings, magazines, inhabited buildings, railroads, highways, and public utility transmission systems;

(d) The name and address of the applicant;

(e) The reason for desiring to manufacture explosives;

(f) The applicant's citizenship, if the applicant is an individual;

(g) If the applicant is a partnership, the names and addresses of the partners and their citizenship;

(h) If the applicant is an association or corporation, the names and addresses of the officers and directors thereof, and their citizenship; and

(i) Such other pertinent information as the director of labor and industries shall require to effectuate the purpose of this chapter.

(4) Each application for license shall be accompanied by a site plan of the proposed or existing manufacturing facilities. The plan shall show:

(a) The distance each manufacturing building is located from other buildings on the premises where people are employed, from other occupied buildings on adjoining property, from buildings where customers are served, from public highways and utility transmission systems.

(b) The site plan shall demonstrate compliance with all applicable requirements of chapter 70.74 RCW, the State Explosives Act as it exists at the time of this adoption or is hereafter amended; with applicable requirements of chapter 296-50 WAC, Safety standards—Manufacture of explosives; with the separation/location requirements of this chapter.

(c) The site plan shall identify and describe all natural or artificial barricades which are utilized to influence minimum permissible separation distances.

(d) The site plan shall identify the nature of and kind of work carried on in each building.

(e) The site plan shall specify the maximum amount and kind of explosives or blasting agents which will be permitted in each building or magazine at any one time.

(5) The application for license shall comply with all requirements of WAC 296-52-421.

(6) Upon receipt of a completed application meeting all requirements of this section, the department will schedule an inspection of the premises at the earliest time possible.

(7) The department will issue a license to the applicant(s) provided that:

(a) The required inspection confirms that the site plan is accurate and the facilities comply with applicable regulations of the department;

(b) The applicant(s) or operating superintendent and employees are sufficiently trained and experienced in the manufacture of explosives.

(8) A license to manufacture explosives and/or blasting agents shall be valid for not more than one year from the date of issue unless suspended or revoked by the department.

(9) A copy of the site plan and manufacturer's license shall be posted in the main office of each manufacturing plant.

(a) The site plan shall be maintained to reflect current status of manufacturing facilities, occupancy changes, etc.

(b) The department shall be notified when significant change occurs in the site plan. If the change is of such nature or magnitude as to make compliance with all requirements of this chapter questionable, the license holder shall consult with the department before changing the operations.

(10) Specific applicable requirements for the manufacture of explosives and blasting agents are codified and distributed in chapter 296-50 WAC, Safety standards—Manufacture of explosives.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-429, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-429, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-429, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-429, filed 5/6/86.]

WAC 296-52-433 Purchaser's license. RCW 70.74.135 and 70.74.137, apply.

(1) No person, firm, partnership, or corporation and including public agencies, shall be permitted to purchase explosives or blasting agents without a valid license as issued by the department of labor and industries.

(2) Applicants desiring to purchase explosives or blasting agents, except hand loader components as defined in this chapter, shall make application for license to the department of labor and industries. Application forms may be obtained at all department district offices, and from explosives dealers.

(3) Applicants shall comply with all requirements of WAC 296-52-421 and shall have a current user (blaster) license issued by the department. The purchaser's license fee shall be five dollars.

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(4) Applicants shall be required to furnish at least the following information:

(a) The location where explosives are to be used;

(b) The kind and amount of explosives to be used;

(c) The name and address of the applicant;

(d) The reason for desiring to use explosives;

(e) The citizenship of the applicant, if the applicant is an individual;

(f) If the applicant is a partnership, the names and addresses of the partners and their citizenship;

(g) If the applicant is an association or corporation, the names and addresses of the officers and directors thereof and their citizenship;

(h) Documented proof of ownership of a licensed storage magazine or a signed authorization to use another person's licensed magazine; or the purchaser shall sign a statement certifying that the explosives will not be stored.

(i) Such other pertinent information as the director of the department of labor and industries shall require to effectuate the purposes of this chapter.

(5) The department will grant a purchaser's license after all legal requirements have been fulfilled.

(6) The license is valid for one year from date of issuance.

(7) Purchaser shall, prior to ordering explosive materials, furnish the dealer a current list of the representatives or agents authorized to order explosive materials on their behalf showing the name, address, drivers license number or valid identification and date and place of birth. A copy of the list shall be submitted with the purchaser's application. The dealer and the department lists shall be updated as changes occur.

(8) The individual who physically receives the purchased explosives shall prove to the satisfaction of the dealer that he, personally, is the purchaser, or the person authorized by the purchaser to receive said purchased explosives. Such authorization procedure shall be approved by the department. Said receiver of explosives shall identify himself properly and shall sign the dealer's record with his legal signature.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-433, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-433, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-433, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-433, filed 5/6/86.]

WAC 296-52-437 User's (blaster's) license. RCW 70.74.020 and 70.74.142, apply.

(1) No person, firm, partnership, or corporation shall use, blast, or dispose of explosives and/or blasting agents unless in possession of a valid user's (blaster's) license issued by the department of labor and industries.

(2) The application for a user's (blaster's) license to use, blast or dispose explosives and blasting agents shall be made to Department of Labor and Industries, Division of Consultation and Compliance, Olympia.

(a) Application forms may be obtained at all department district offices, and from explosives dealers.

(b) The license is valid for one year from date of issuance. The license fee shall be five dollars.

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(c) Applicants shall comply with all requirements of WAC 296-52-421.

(d) User (blaster) may be required to verify name of licensed purchaser, which will be confirmed and approved by the department.

(3) In addition to the submission of the application form, all new applicants, all applicants requesting change in classification of their license, and all applicants who have not renewed their user (blaster) license within sixty days of expiration will be required to submit a resume of successful blasting experience, properly witnessed, and to pass a written examination prepared and administered by the department.

(4) User (blaster) qualifications:

(a) A user (blaster) shall be able to understand and give written and oral orders.

(b) A user (blaster) shall be in good physical condition and not be addicted to narcotics, intoxicants, or similar types of drugs. This rule does not apply to persons taking prescription drugs and/or narcotics as directed by a physician providing such use shall not endanger the worker or others.

(c) A user (blaster) shall be qualified by reason of training, knowledge, and experience, in the field of transporting, storing, handling, and use of explosives, and have a working knowledge of state and local laws and regulations which pertain to explosives.

(d) User (blaster) shall be required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required.

(e) The user (blaster) shall be knowledgeable and competent in the use of each type of blasting method used.

(5) The department will issue a user's license card which shall state the limitations imposed on the licensee and shall be presented by the user to authorized persons, upon request, together with valid personal identification.

(6) A "hand loader" as defined in this chapter, does not require a user's license.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-437, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-437, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-437, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-437, filed 5/6/86.]

WAC 296-52-441 Storage magazine license requirements. RCW 70.74.120, applies.

(1) All explosives or blasting agents as defined in this chapter shall be kept or stored in magazines licensed by the department and which comply with the construction, location, and security requirements established by this chapter.

(2) Any person engaged in keeping or storing explosives or blasting agents shall make application to the department for an operating license for each storage magazine before engaging in the activity of keeping or storing explosives or blasting agents. Applications shall be made to the Department of Labor and Industries, Division of Consultation and Compliance, Olympia, WA 98504.

(3) License applicants shall meet the requirements of WAC 296-52-421.

(4) License applicants or the officers, agents, or employees of the applicant shall demonstrate sufficient experience in the handling of explosives, including the storage require-

ments for the different types of explosives or blasting agents to be stored.

(5) Each application shall include the following information:

(a) The name and address of the applicant;

(b) The reason for desiring to store or possess explosives;

(c) The citizenship of the applicant if the applicant is an individual;

(d) If the applicant is a partnership, the names and addresses of the partners and their citizenship;

(e) If the applicant is an association or corporation, the names and addresses of the officers and directors thereof and their citizenship;

(f) The location of the magazine, if then existing, or in case of a new magazine, the proposed location of such magazine;

(g) The kind of explosives that are kept or stored or possessed or intended to be kept or stored or possessed and the maximum quantity that is intended to be kept or stored or possessed thereat;

(h) The distance that such magazine is located or intended to be located from other magazines, inhabited buildings, explosives manufacturing buildings, railroads, highways, and public utility transmission systems;

(i) And such other pertinent information as the director of the department of labor and industries shall require to effectuate the purpose of this chapter.

(6) A license number shall be permanently affixed on the inside and outside of each storage magazine. This license number will stay with each magazine during its life.

(7) If the magazine is used or leased by a person other than the owner, such other person shall then be responsible for the safe operation of the magazine, and for obtaining of the license.

When the responsibility for a magazine is transferred from one person to another, the transferor shall immediately notify the department, stating the magazine license number. The transferee shall execute a new application and pay the fee for one year, based on WAC 296-52-449.

(8) When a magazine is moved, altered or destroyed, the responsible person shall notify the department stating the magazine license number. When a magazine is altered, the alterations made shall be stated.

The moving of a magazine on a job site within a reasonable distance from its original location stated on the application is permitted without notifying the department; provided, that the new location complies with the Explosives Act and Explosives Code, and that the magazine can be quickly located for an inspection.

(9) Licenses will be issued pursuant to the procedures identified in WAC 296-52-445. The license fees are published in WAC 296-52-449.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-441, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-441, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-441, filed 5/6/86.]

WAC 296-52-445 Licenses and inspections. RCW 70.74.150, applies.

(1) Upon receipt of a completed application for license, the department will schedule the necessary inspection or examination at the earliest available and mutually agreeable date.

(2) Explosives manufacturing plants and all Class 2, 3, 4, or 5 magazines shall be inspected before being placed in operation or service and at annual intervals thereafter. New licenses or renewal licenses shall be issued for a period not to exceed one year. Class 1 magazines may be inspected and licensed for a period not to exceed two years.

(3) Each explosives license shall identify the operating limits for that license.

(4) Each license shall be valid until the specified expiration date or until suspended or revoked by the department.

(5) Any change in the conditions around a manufacturing plant or magazine shall be promptly identified to the department if such change could influence compliance with all requirements of this chapter. Such change(s) could include but are not limited to examples such as: Construction of occupied buildings, public utilities transmission systems, roads or railroads nearer said manufacturing plant or magazine.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-52-445, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-445, filed 5/6/86.]

WAC 296-52-449 Storage magazine license fees. RCW 70.74.140, applies.

The annual license fee for operating each magazine has been established by the department and shall be as shown in the following table:

Maximum weight (pounds) of explosives permitted in each magazine	Maximum number of blasting caps permitted in each magazine	Annual fee (dollars) for each magazine
200	133,000	10.00
1,000	667,000	25.00
5,000	3,335,000	35.00
10,000	6,670,000	45.00
50,000	33,350,000	60.00
Max. 300,000	Max. 200,000,000	75.00

Any permanent magazine licensed for two years shall pay twice the license fee shown.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-449, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-449, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-449, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-449, filed 5/6/86.]

PART C—MAGAZINE CONSTRUCTION

WAC 296-52-453 Construction of magazines. (1) Construction of all explosive storage magazines must comply with Washington state and Bureau of Alcohol, Tobacco, and Firearms regulations.

(2) Construction of permanent storage facilities.

(a) General. A Class 1 storage facility shall be a permanent structure; a building, an igloo or army-type structure, a tunnel, or a dugout. It shall be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and well ventilated.

(2001 Ed.)

(b) Buildings. All building type storage facilities shall be constructed of masonry, wood, metal, or a combination of these materials and shall have no openings except for entrances and ventilation. Ground around such storage facilities shall slope away for drainage.

(c) Masonry wall construction. Masonry wall construction shall consist of brick, concrete, tile, cement block, or cinder block and shall be not less than 6 inches in thickness. Hollow masonry units used in construction shall have all hollow spaces filled with well tamped coarse dry sand or weak concrete (a mixture of one part cement and eight parts of sand with enough water to dampen the mixture while tamping in place). Interior wall shall be covered with a nonsparking material.

(d) Fabricated metal wall construction. Metal wall construction shall consist of sectional sheets of steel or aluminum not less than number 14 gauge, securely fastened to a metal framework. Such metal wall construction shall be either lined inside with brick, solid cement blocks, hardwood not less than 4 inches in thickness or material of equivalent strength, or shall have at least a 6 inch sand fill between interior and exterior walls. Interior walls shall be constructed of or covered with a nonsparking material.

(e) Wood frame wall construction. The exterior of outer wood walls shall be covered with iron or aluminum not less than number 26 gauge. An inner wall of nonsparking materials shall be constructed so as to provide a space of not less than 6 inches between the outer and inner walls, which space shall be filled with coarse dry sand or weak concrete.

(f) Floors. Floors shall be constructed of a nonsparking material and shall be strong enough to bear the weight of the maximum quantity to be stored.

(g) Foundations. Foundations shall be constructed of brick, concrete, cement block, stone, or wood posts. If piers or posts are used, in lieu of a continuous foundation, the space under the buildings shall be enclosed with metal.

(h) Roof.

(i) Except for buildings with fabricated metal roofs, the outer roof shall be covered with no less than number 26-gauge iron or aluminum fastened to a 7/8-inch sheathing.

(ii) Where it is possible for a bullet to be fired directly through the roof and into the storage facility at such an angle that the bullet would strike a point below the top of inner walls, storage facilities shall be protected by one of the following methods:

(A) A sand tray shall be located at the tops of inner walls covering the entire ceiling area, except that necessary for ventilation, lined with a layer of building paper, and filled with not less than 4 inches of coarse dry sand.

(B) A fabricated metal roof shall be constructed of 3/16-inch plate steel lined with 4 inches of hardwood or material of equivalent strength (for each additional 1/16-inch of plate steel, the hardwood or material of equivalent strength lining may be decreased one inch).

(i) Doors. All doors shall be constructed of 1/4-inch plate steel and lined with 2 inches of hardwood or material of equivalent strength. Hinges and hasps shall be attached to the doors by welding, riveting or bolting (nuts on inside of door). They shall be installed in such a manner that the hinges and

hasps cannot be removed when the doors are closed and locked.

(j) Locks. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three-point lock. Padlocks shall have at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter. Padlocks shall be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(k) Ventilation. Except at doorways, a 2-inch air space shall be left around ceilings and the perimeter of floors. Foundation ventilators shall be not less than 4 by 6 inches. Vents in the foundation, roof, or gables shall be screened and offset.

(l) Exposed metal. No sparking metal construction shall be exposed below the top of walls in the interior of storage facilities, and all nails therein shall be blind-nailed, counter-sunk or nonsparking.

(m) Igloos, army-type structures, tunnels and dugouts. Storage facilities shall be constructed of reinforced concrete, masonry, metal or a combination of these materials. They shall have an earthmound covering of not less than 24 inches on the top, sides and rear unless the magazine meets the requirements of (h)(ii) of this subsection. Interior walls and floors shall be covered with a nonsparking material. Storage facilities of this type shall also be constructed in conformity with the requirements of subsection (1)(a), (b), (f), (i), (j), (k) and (l) of this section.

(3) Construction of portable (field) storage facilities.

(a) General. A Class 2 storage facility shall be a box, a trailer, a semitrailer or other mobile facility. It shall be bullet-resistant, fire-resistant, weather-resistant, theft-resistant, and well ventilated. Portable magazines shall be at least one cubic yard in size. The floor shall be supported to prevent direct contact with the ground. The ground around magazines shall slope away for drainage or other adequate drainage provided. When unattended, vehicular magazines shall have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods approved by the department.

(b) Construction. The exterior and doors shall be constructed of not less than 1/4-inch steel and lined with at least two inches of hardwood. Magazines with top openings shall have lids with water-resistant seals or shall overlap the sides by at least one inch when in a closed position.

(c) Hinges and hasps. Hinges and hasps shall be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps shall be installed so that they cannot be removed when the doors are closed and locked.

(d) Locks. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three-point lock. Padlocks shall have at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter.

Padlocks shall be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(e) Ventilation. Except at doorways, a 2-inch air space shall be left around ceilings and the perimeter of floors. Foundation ventilators shall be not less than 4 by 6 inches. Vents in the foundation, roof, or gables shall be screened and offset.

(f) Exposed metal. No sparking metal construction shall be exposed below the top of walls in the interior of storage facilities and all nails therein shall be blind-nailed, counter-sunk, or nonsparking.

Note: The following alternatives may be used. (All steel and wood dimensions indicated are actual thicknesses. To meet the concrete block and brick dimensions indicated, the manufacturer's represented thicknesses may be used.)

(i) Exterior of 5/8-inch steel, lined with an interior of any type of nonsparking material.

(ii) Exterior of 1/2-inch steel, lined with an interior of not less than 3/8-inch plywood.

(iii) Exterior of 3/8-inch steel, lined with an interior of two inches of hardwood.

(iv) Exterior of 3/8-inch steel, lined with an interior of three inches of softwood or 2-1/4-inches of plywood.

(v) Exterior of 1/4-inch steel, lined with an interior of five inches of softwood or 5-1/4-inches of plywood.

(vi) Exterior of 3/16-inch steel, lined with an interior of four inches of hardwood.

(vii) Exterior of 3/16-inch steel, lined with an interior of seven inches of softwood or 6-3/4-inches of plywood.

(viii) Exterior of 3/16-inch steel, lined with an intermediate layer of three inches of hardwood and an interior lining of 3/4-inch plywood.

(ix) Exterior of 1/8-inch steel, lined with an interior of five inches of hardwood.

(x) Exterior of 1/8-inch steel, lined with an interior of nine inches of softwood.

(xi) Exterior of 1/8-inch steel, lined with an intermediate layer of four inches of hardwood and an interior lining of 3/4-inch plywood.

(xii) Exterior of any type of fire-resistant material which is structurally sound, lined with an intermediate layer of four inches solid concrete block or four inches solid brick or four inches of solid concrete, and an interior lining of 1/2-inch plywood placed securely against the masonry lining.

(xiii) Standard eight-inch concrete block with voids filled with well-tamped sand/cement mixture.

(xiv) Standard eight-inch solid brick.

(xv) Exterior of any type of fire-resistant material which is structurally sound, lined with an intermediate six-inch space filled with well-tamped dry sand or well-tamped sand/cement mixture.

(xvi) Exterior of 1/8-inch steel, lined with a first intermediate layer of 3/4-inch plywood, a second intermediate layer of 3-5/8-inches well-tamped dry sand or sand/cement mixture and an interior lining of 3/4-inch plywood.

(xvii) Exterior of any type of fire-resistant material, lined with a first intermediate layer of 3/4-inch plywood, a second intermediate layer of 3-5/8-inch well-tamped dry sand or sand/cement mixture, a third intermediate layer of 3/4-inch plywood, and a fourth intermediate layer of two inches of hardwood or 14-gauge steel and an interior lining of 3/4-inch plywood.

(xviii) Eight-inch thick solid concrete.

(4) Construction of detonator (blasting cap) indoor storage facilities.

Note: BATF regulations § 55.208(b) permits an indoor (federal) type 2 magazine to contain up to 50 pounds of high explosives or up to 5,000 caps (detonators) provided that no magazine for explosives storage may be located in a residence or dwelling (as defined). The department of labor and industries calculates 1,000 standard No.8 caps (detonators) as the equivalency of 1-1/2 pounds high explosives. This chapter permits a (state) type 3 indoor storage magazine for up to 1,000 No. 8 caps to be located within access controlled buildings such as warehouses, shops, and maintenance buildings, but specifically excluding any residence or dwelling, provided that the building shall comply with all applicable Washington Administrative Code and NFPA requirements and the magazine shall be constructed in compliance with this section.

(a) General. Class 3 storage facility for detonators (blasting caps) in quantities of 1,000 or less shall be fire-resistant and theft-resistant. They need not be bullet-resistant and weather-resistant if the locked uninhabited building in which they are stored provide protection from the weather and from bullet penetration.

(b) Construction. Sides, bottoms and covers shall be constructed of not less than number 12-gauge metal and lined with a nonsparking material.

(c) Hinges and hasps shall be attached so they cannot be removed from the outside.

(d) Locks. One steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter is sufficient for locking purposes.

(i) A magazine for indoor cap storage is not required to be at least 1 cubic yard in size provided that it is otherwise constructed in compliance with the requirements of this section.

(ii) Class 3 magazines, when located indoors, shall be painted red and appropriately labeled for ready identification in case of fire.

(5) Construction of blasting agent, low explosive or electric blasting cap storage facilities.

(a) General. A Class 4 storage facility may be a building, an igloo, or army-type structure, a tunnel, a dugout, a box, a trailer, or a semitrailer or other mobile facility. They shall be fire-resistant, weather-resistant and theft-resistant. The ground around such storage facilities shall slope away for drainage. When unattended, vehicular storage facilities shall have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods approved by the department.

Note: As a result of tests with electric blasting caps, it has been determined that these blasting caps are not subject to sympathetic detonation. Therefore, a Class 4 storage facility meets the necessary requirements for storage of electric blasting caps.

(b) Construction. These magazines shall be constructed of masonry, metal-covered wood, fabricated metal, or a combination of these materials. Foundations are to be constructed of brick, concrete, cement block, stone, or metal or wood posts. If piers or posts are used, in lieu of a continuous foundation, the space under the building shall be enclosed with fire-resistant material. The walls and floors are to be constructed of, or covered with, a nonsparking material or lattice work. The doors shall be metal or solid wood covered with metal.

(c) Hinges and hasps. Hinges and hasps shall be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps shall be installed so that they cannot be removed when the doors are closed and locked.

(d) Locks. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three-point lock. Padlocks shall have at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter. Padlocks shall be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps and staples. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(6) Construction of blasting agent storage facilities.

(a) General. A Class 5 storage facility may be a building, igloo or army-type structure, tunnel, dugout, bin, box, trailer, or a semitrailer or other mobile facility. They shall be weather-resistant and theft-resistant. The ground around such storage facilities shall slope away for drainage. When unattended, vehicular storage facilities shall have wheels removed or otherwise effectively immobilized by kingpin locking devices or other methods approved by the department.

(b) Construction. The doors shall be constructed of solid wood or metal.

(c) Hinges and hasps. Hinges and hasps shall be attached to doors by welding, riveting, or bolting (nuts on inside of door). Hinges and hasps shall be installed so that they cannot be removed when the doors are closed and locked.

(d) Locks. Each door shall be equipped with two mortise locks; or with two padlocks fastened in separate hasps and staples; or with a combination of mortise lock and a padlock, or with a mortise lock that requires two keys to open; or a three-point lock. Padlocks shall have at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter. Padlocks shall be protected with not less than 1/4-inch steel hoods constructed so as to prevent sawing or lever action on the locks, hasps, and staples.

Note: Trailers, semitrailers, and similar vehicular magazines may, for each door, be locked with one steel padlock (which need not be protected by a steel hood) having at least 3/8-inch diameter, if the door hinges and lock hasp are securely fastened to the magazine and to the door frame. These requirements do not apply to magazine doors that are adequately secured on the inside by means of a bolt, lock, or bar that cannot be actuated from the outside.

(7) Construction of day box storage facilities for explosives.

(a) General. A temporary storage facility shall be a day box. It must be fire-resistant, weather-resistant and theft-resistant. The ground around such storage facilities shall slope away for drainage.

(b) Construction. A day box shall be constructed of not less than number 12-gauge (.1046 inches) steel, lined with at least either 1/2-inch plywood or 1/2-inch Masonite-type hardboard. Doors shall overlap sides by at least one inch.

(c) Hinges and hasps. Hinges and hasps are to be attached by welding, riveting or bolting (nuts on inside).

(d) Locks. One steel padlock (which need not be protected by a steel hood) having at least five tumblers and a case-hardened shackle of at least 3/8-inch diameter is sufficient for locking purposes.

(e) Unattended storage. No explosive materials shall be left in a day box if unattended. The explosive materials contained therein shall be removed to licensed storage facilities for unattended storage.

(8) Construction of day box storage facilities for detonators (blasting caps).

(a) General. Temporary storage facilities for blasting caps in quantities of 1,000 or less.

(b) Construction. Sides, bottoms and covers shall be constructed of number 12-gauge metal and lined with a nonsparking material.

(c) Hinges and hasps shall be attached thereto by welding.

(d) Locks. A single five-tumbler proof lock shall be sufficient for locking purposes.

(e) No explosive materials shall be left in such facilities if unattended. The explosive materials contained therein shall be removed to licensed storage facilities for unattended storage.

(9) Magazine heating systems requirements, NFPA Code No. 495, "Manufacture, Transportation, Storage and Use of Explosive Materials, 1992," and the following will apply:

(a) Magazines requiring heat shall be heated by either hot water radiant heating within the magazine building; or air directed into the magazine building over either hot water or low pressure steam (15 psig) coils located outside the magazine building.

(b) The magazine heating systems shall meet the following requirements:

(i) The radiant heating coils within the building shall be installed in such a manner that the explosive materials or their containers cannot contact the coils and air is free to circulate between the coils and the explosive materials or their containers.

(ii) The heating ducts shall be installed in such a manner that the hot air discharge from the duct is not directed against the explosive materials or their containers.

(iii) The heating device used in connection with a magazine shall have controls which prevent the ambient building temperature from exceeding 130°F.

(iv) The electric fan or pump used in the heating system for a magazine shall be mounted outside and separate from the wall of the magazine and shall be grounded.

(v) The electric fan motor and the controls for electrical heating devices used in heating water or steam shall have

overloads and disconnects, which comply with the National Electrical Code, (National Fire Protection Association, NFPA No. 70-1992). All electrical switch gear shall be located a minimum distance of 25 feet from the magazine.

(vi) The heating source for water or steam shall be separated from the magazine by a distance of not less than 25 feet when electrical and 50 feet when fuel-fired. The area between the heating unit and the magazine shall be cleared of all combustible materials.

(vii) The storage of explosive materials and their containers in the magazine shall allow uniform air circulation so temperature uniformity can be maintained throughout the explosive materials.

(10) Lighting.

(a) Battery-activated safety lights or battery-activated safety lanterns may be used in explosives storage magazines.

(b) Electric lighting used in any explosives storage magazine shall meet the standards prescribed by the "National Electrical Code," (National Fire Protection Association, NFPA 70-1992), for the conditions present in the magazine at any time. All electrical switches shall be located outside of the magazine and also meet the standards prescribed by the National Electrical Code.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-453, filed 3/6/95, effective 4/20/95. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-453, filed 5/6/86.]

PART D—EXPLOSIVES STORAGE

WAC 296-52-457 Storage of caps with other explosives prohibited. No blasting caps, or other detonating or fulminating caps, or detonators, or flame-producing devices shall be kept or stored in any magazine in which other explosives are kept or stored.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-457, filed 5/6/86.]

WAC 296-52-461 Storage of explosives. (1) General.

(a) All Class A, Class B, Class C explosives, and special industrial explosives, and any newly developed and unclassified explosives, shall be kept in magazines which meet the requirements as defined in chapter 70.74 RCW and chapter 296-52 WAC, unless they are in the process of manufacture, being physically handled in the operating process, being used or being transported to a place of storage or use. No explosives and no detonators (blasting caps) in quantities of 1,001 or more shall be stored in any building or structure except a Class 1, permanent, magazine that has been approved and licensed.

Note 1: Separate storage of components capable of detonation when mixed. Any two components which, when mixed, become capable of detonation by a number 6 cap must be stored in separate locked containers or in a licensed, approved magazine.

Note 2: Electromagnetic radiation. Blasting operations or storage of electrical detonators shall be prohibited in vicinity of operating radio frequency (RF) transmitter stations except where the clearances, as referenced in WAC 296-52-493(g), can be observed.

Note 3: Blasting caps, electric blasting caps, detonating primers and primed cartridges shall not be stored in the same magazine with other explosives.

(b) Subsection (1) of this section does not apply to:

(i) Stocks of small arms ammunition, propellant-actuated power cartridges, small arms ammunition primers in quantities of less than 750,000, smokeless propellants in quantities of less than 150 pounds or black powder, as used in muzzle loading firearms, in quantities of less than 25 pounds;

(ii) Explosive-actuated power devices when in quantities less than 50 pounds net weight of explosives;

(iii) Fuse lighters and fuse igniters;

(iv) Safety fuses other than cordeau detonant fuses.

(2) Quantity restrictions. Explosive materials in excess of 300,000 pounds or blasting caps in excess of 20,000,000 shall not be stored in one storage magazine.

(3) Inventory and responsibility.

(a) Magazines shall be in the charge of a qualified person at all times who shall be at least twenty-one years of age, and who shall be held responsible for the enforcement of all safety precautions.

(b) All explosives shall be accounted for at all times. Explosives not being used shall be kept in a locked magazine, unavailable to persons not authorized to handle them. The employer shall maintain an inventory and use record of all explosives.

(c) Any person or company storing explosive material shall inspect their magazine at least every seven days. This inspection need not be an inventory, but must be sufficient to determine whether there has been unauthorized entry or attempted entry into the magazines or unauthorized removal of the contents of the magazines.

(i) The person conducting weekly inspection must be familiar with the magazine being inspected and the contents.

(ii) The inspecting person shall date and sign the inspection log, inventory sheet or other record upon completion of each inspection.

(iii) The proof of weekly inspection shall be maintained for not less than one year.

(d) A person who knows of a theft or loss of explosives for which that person is responsible under this chapter shall report the theft or loss to the local law enforcement agency within twenty-four hours of discovery of the theft or loss. The local law enforcement agency shall immediately report the theft or loss to the department of labor and industries.

It is recommended that any person who knows of an attempted unauthorized entry should report same to the local law enforcement agency.

(4) Surrounding area.

(a) Firearms (except firearms carried by qualified guards and qualified law enforcement officers) shall not be permitted inside of or within 50 feet of magazines.

(b) The area surrounding magazines is to be kept clear of rubbish, brush, dry grass, or trees (except of live trees more than 10 feet tall), for not less than 25 feet in all directions.

(c) Volatile materials are to be kept a distance of not less than 50 feet from outdoor magazines. Living foliage which is used to stabilize earthen covering of a magazine need not be removed.

(d) Smoking, matches, open flames, and spark-producing devices are not permitted:

(i) In any magazine;

(ii) Within 50 feet of any outdoor magazine; or

(iii) Within any room containing an indoor magazine.

(5) Signs. The premises on which a magazine is located shall be conspicuously marked with signs as illustrated below. Such signs shall warn any person approaching the magazine of the presence of explosives, but shall be so located that a bullet passing directly through the face of the sign will not strike the magazine.

**DANGER: EXPLOSIVES
STORAGE AREA. KEEP
OUT. NO SHOOTING.
DO NOT FIGHT
EXPLOSIVE FIRES.
PHONE: _____**

Letters: 3" high X 2" wide

Reflectorized finish
White background with
Red letters

Note: The phone number should be that of the individual or company responsible for the contents of the magazine.

Approved U.S. Department of Transportation placards must remain on Class 5 trailers, containing blasting agents while unattended.

(6) Temporary storage at a site for blasting operations shall be located away from neighboring inhabited buildings, railways, highways, and other magazines. A distance of at least one hundred and fifty feet shall be maintained between magazines and the work in progress when the quantity of explosives kept therein is in excess of 25 pounds, and at least 50 feet when the quantity of explosives is 25 pounds or less.

(7) Explosives recovered from blasting misfires shall be placed separately in an approved magazine until competent personnel have determined from the manufacturer the method of disposal. Suspected defective caps recovered from blasting misfires shall not be reused. Such explosives and caps shall then be disposed of in the manner recommended by the manufacturer.

(8) Storage within magazines.

(a) Explosives which are not conspicuously age date marked by the manufacturer shall be marked with the manufacturing date before being stored in the magazine.

Note: Unidentified explosives confiscated by law enforcement may be marked with the confiscation date if the manufacturer's date is unknown.

(b) Explosive materials within a magazine shall not be placed directly against interior walls, and must not be stored so as to interfere with ventilation. To prevent contact of stored explosive materials with the interior walls, a nonsparking lattice work or other nonsparking material may be used.

(c) Packages of explosives shall be laid flat with the top side up and shall be piled in a stable manner.

Exception: Nitroglycerin based dynamite in long-term storage may be inverted (turned top down) at intervals recommended by the product manufacturer.

(d) Corresponding grades and brands shall be stored together in such a manner that brands and grade marks show. All stocks shall be stored so as to be easily counted and checked.

(e) Black powder when stored in magazines with other explosives shall be stored separately. Black powder stored in kegs shall be stored on ends, bungs down, or on side, seams down.

(f) When any kind of explosive is removed from a magazine for use, the oldest explosive of that particular kind shall always be taken first.

(g) Except with respect to fiberboard or other nonmetal containers, containers of explosives shall not be unpacked or repacked in a magazine nor within 50 feet of a magazine or in close proximity to other explosives.

(h) Tools used for opening packages of explosives shall be constructed of nonsparking materials, except that nonsparking metallic slitters may be used for opening fiberboard boxes. A wood wedge and a fiber, rubber, or wood mallet shall be used for opening or closing wood packages of explosives. Opened packages of explosives shall be securely closed before being returned to a magazine.

(i) Magazines shall not be used for the storage of any metal tools nor any commodity except explosives, blasting agents and blasting supplies.

(j) Magazine floors shall be regularly swept, kept clean, dry, free of grit, paper, empty used packages, and rubbish. Brooms and other cleaning utensils shall not have any spark-producing metal parts. Sweepings from floors of magazines shall be properly disposed of. Magazine floors stained with nitroglycerin shall be cleaned according to instructions by the manufacturer.

(k) When any explosive has deteriorated to an extent that it is in an unstable or dangerous condition, or if nitroglycerin leaks from any explosives, then the person in possession of such explosive shall immediately proceed to destroy such explosive in accordance with the instructions of the manufacturer. Only experienced persons shall be allowed to do the work of destroying explosives.

(l) Magazine repairs.

(i) All explosives shall be removed from the magazine and the floor shall be cleaned before commencing repairs inside a magazine.

(ii) When making outside repairs on a magazine and the work could cause sparks or fire, all explosives shall be removed from the magazine before commencing repair activities.

(iii) Explosives removed from a magazine under repair shall be placed in another magazine or placed a safe distance from the magazine under repair and shall be properly attended until returned to the magazine.

(9) Underground storage.

(a) Explosives and related materials shall be stored in approved facilities required under the provisions of chapter 296-52 WAC.

(b) No explosives or blasting agents shall be permanently stored in any underground operation until the operation has been developed to the point where at least two modes of exit have been developed.

(c) Permanent underground storage magazines shall be at least 300 feet from any shaft, adit, or active underground working area.

(d) Permanent underground magazines containing detonators shall not be located closer than 50 feet to any magazine containing other explosives or blasting agents.

(e) Upon the approach of an electrical storm, unless a greater hazard would be created thereby, explosives at the adit or the top of any shaft leading to where persons are working shall be moved away from such location a distance equal to that required for inhabited buildings, as listed in Table H-20.

(10) All explosive manufacturing buildings and magazines in which explosives or blasting agents, except small arms ammunition and smokeless powder are had, kept, or stored, must be located at distances from inhabited buildings, railroads and highways in conformity with the following quantity and distance tables, and these tables shall be the basis on which applications for license for storage shall be made and license for storage issued, as provided in RCW 70.74.110 and 70.74.120. Blasting and electric blasting caps in strength through number 8 shall be rated as one and one-half pounds of explosives per one thousand caps. Blasting and electric blasting caps of strength higher than number 8 shall be computed on the combined weight of explosives.

(11) When two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways, and highways, and in addition, they should be separated from each other by not less than the distances shown for "separation of magazines", except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives. If any two or more magazines are separated from each other by less than the specified "separation of magazines" distances, then such two or more magazines, as a group, must be considered as one magazine, and the total quantity of explosives stored in such group must be treated as if stored in a single magazine located on the site of any magazine of the group, and must comply with the minimum of distances specified from other magazines, inhabited buildings, railways and highways.

Illustration, Table H-20

Table of Distances for Storage of Explosives

Quantity of Explosive (In Pounds)		Distances (in Feet)					
		Inhabited Buildings		Public Highways Class A to D_		Passenger Railways and Public Highways: With Traffic Volume of More Than 3,000 Vehicles Per Day	
Over	Not Over	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded
2	5	70	140	30	60	51	102
5	10	90	180	35	70	64	128
10	20	110	220	45	90	81	162
20	30	125	250	50	100	93	186
30	40	140	280	55	110	103	206
40	50	150	300	60	120	110	220
50	75	170	340	70	140	127	254
75	100	190	380	75	150	139	278
100	125	200	400	80	160	150	300
125	150	215	430	85	170	159	318
150	200	235	470	95	190	175	350
200	250	255	510	105	210	189	378
250	300	270	540	110	220	201	402
300	400	295	599	120	240	221	442
400	500	320	640	130	260	238	476
500	600	340	680	135	270	253	506
600	700	355	710	145	290	266	532
700	800	375	750	150	300	278	556
800	900	390	780	155	310	289	578
900	1,000	400	800	160	320	300	600
1,000	1,200	425	850	165	330	318	636
1,200	1,400	450	900	170	340	336	672
1,400	1,600	470	940	175	350	351	702
1,600	1,800	490	980	180	360	366	732
1,800	2,000	505	1,010	185	370	378	756
2,000	2,500	545	1,090	190	380	408	816
2,500	3,000	580	1,160	195	390	432	864
3,000	4,000	635	1,270	210	420	474	948
4,000	5,000	685	1,370	225	450	513	1,026
5,000	6,000	730	1,460	235	470	546	1,092
6,000	7,000	770	1,540	245	490	573	1,146
7,000	8,000	800	1,600	250	500	600	1,200
8,000	9,000	835	1,670	255	510	624	1,248
9,000	10,000	865	1,730	260	520	645	1,290
10,000	12,000	875	1,750	270	540	687	1,374
12,000	14,000	885	1,770	275	550	723	1,446
14,000	16,000	900	1,800	280	560	756	1,512
16,000	18,000	940	1,880	285	570	786	1,572
18,000	20,000	975	1,950	290	580	813	1,626
20,000	25,000	1,055	2,000	315	630	876	1,752
25,000	30,000	1,130	2,000	340	680	933	1,866
30,000	35,000	1,205	2,000	360	720	931	1,962
35,000	40,000	1,275	2,000	380	760	1,026	2,000
40,000	45,000	1,340	2,000	400	800	1,068	2,000
45,000	50,000	1,400	2,000	420	840	1,104	2,000
50,000	55,000	1,460	2,000	440	880	1,140	2,000
55,000	60,000	1,515	2,000	455	910	1,173	2,000
60,000	65,000	1,565	2,000	470	940	1,206	2,000
65,000	70,000	1,610	2,000	485	970	1,236	2,000
70,000	75,000	1,655	2,000	500	1,000	1,263	2,000
75,000	80,000	1,695	2,000	510	1,020	1,293	2,000
80,000	85,000	1,730	2,000	520	1,040	1,317	2,000
85,000	90,000	1,760	2,000	530	1,060	1,344	2,000
90,000	95,000	1,790	2,000	540	1,080	1,368	2,000
95,000	100,000	1,815	2,000	545	1,090	1,392	2,000
100,000	110,000	1,835	2,000	550	1,100	1,437	2,000
110,000	120,000	1,855	2,000	555	1,110	1,479	2,000
120,000	130,000	1,875	2,000	560	1,120	1,521	2,000
130,000	140,000	1,890	2,000	565	1,130	1,557	2,000
140,000	150,000	1,900	2,000	570	1,140	1,593	2,000
150,000	160,000	1,935	2,000	580	1,160	1,629	2,000
160,000	170,000	1,965	2,000	590	1,180	1,662	2,000
170,000	180,000	1,990	2,000	600	1,200	1,695	2,000
180,000	190,000	2,010	2,010	605	1,210	1,725	2,000
190,000	200,000	2,030	2,030	610	1,220	1,755	2,000

Quantity of Explosive (In Pounds)		Distances (in Feet)							
		Inhabited Buildings		Public Highways Class A to D		Passenger Railways and Public Highways: With Traffic Volume of More Than 3,000 Vehicles Per Day			
Over	Not Over	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded
200,000	210,000	2,055	2,055	620	1,240	1,782	2,000		
210,000	230,000	2,100	2,100	635	1,270	1,836	2,000		
230,000	250,000	2,155	2,155	650	1,300	1,890	2,000		
250,000	275,000	2,215	2,215	670	1,340	1,950	2,000		
275,000	300,000	2,275	2,275	690	1,380	2,000	2,000		

*** Note 1: Terms used in Table H-20 are found in WAC 296-52-417.

Note 2: Source of Table data is BATF (6/90) §55.218.

[Statutory Authority: Chapter 49.17 RCW, 95-07-014, § 296-52-461, filed 3/6/95, effective 4/20/95; 92-17-022 (Order 92-06), § 296-52-461, filed 8/10/92, effective 9/10/92; 90-03-029 (Order 89-20), § 296-52-461, filed 1/11/90, effective 2/26/90. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-10-044 (Order 86-24), § 296-52-461, filed 5/6/86.]

WAC 296-52-465 Storage of ammonium nitrate. (1)

Scope and definitions.

(a) Except as provided in (d) of this subsection applies to the storage of ammonium nitrate in the form of crystals, flakes, grains, or prills including fertilizer grade, dynamite grade, nitrous oxide grade, technical grade, and other mixtures containing 60 percent or more ammonium nitrate by weight but does not apply to blasting agents.

(b) This section does not apply to the transportation of ammonium nitrate while such transportation is being conducted under U.S. DOT jurisdiction and in compliance with DOT regulations (see 49 CFR Part 173).

(c) This section does not apply to storage under the jurisdiction of and in compliance with the regulations of the United States Coast Guard (see 46 CFR Parts 146-149).

(d) This section shall not apply to storage of ammonium nitrate and ammonium nitrate mixtures which are more sensitive than allowed by the "Definition and Test Procedures for Ammonium Nitrate Fertilizers" from the FERTILIZER INSTITUTE. Storage of ammonium nitrate which is above the sensitivity criteria shall comply with WAC 296-52-469, Storage of Blasting Agents and Supplies.

(e) Nothing in this section shall apply to the production of ammonium nitrate or to the storage of ammonium nitrate on the premises of the producing plant, provided that no distinct undue hazard to employees or the public is created.

(f) The definition and test procedures for ammonium nitrate fertilizer are those found in the bulletin, "Definition and test procedures for ammonium nitrate fertilizer," available from the Fertilizer Institute, 501 2nd St. N.E., Washington, D.C. 20006. This definition limits the contents of organic materials, metals, sulfur, etc., in a product that may be classified ammonium nitrate fertilizer.

(g) The standards for ammonium nitrate (nitrous oxide grade) are those found in the "specifications, properties, and recommendations for packaging, transportation, storage, and use of ammonium nitrate," available from the Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4100.

(2) General provisions.

(a) This subsection applies to all persons storing, having, or keeping ammonium nitrate, and to the owner or lessee of any building, premises, or structure in which ammonium

nitrate is stored in quantities of 1,000 pounds (454 kg) or more.

(b) Approval of large quantity storage shall be subject to due consideration of the fire and explosion hazards, including exposure to toxic vapors from burning or decomposing ammonium nitrate.

(c) Storage buildings shall not have basements unless the basements are open on at least one side. Storage buildings shall not be over one story in height.

(d) Storage buildings shall have adequate ventilation or be of a construction that will be self-ventilating in the event of fire.

(e) The wall on the exposed side of a storage building within 50 feet (15.2 m) of a combustible building, forest, piles of combustible materials and similar exposure hazards shall be of fire-resistive construction. (See NFPA Std. 220, Type 1 Construction.) In lieu of the fire-resistive wall, other suitable means of exposure protection such as a free standing wall may be used. The roof coverings shall be Class C or better, as defined in Roof Coverings, NFPA 203M-1970.

(f) All flooring in storage and handling areas, shall be of noncombustible material or protected against impregnation by ammonium nitrate and shall be without open drains, traps, tunnels, pits, or pockets into which any molten ammonium nitrate could flow and be confined in the event of fire.

(g) The continued use of an existing storage building or structure not in strict conformity with this section may be approved in cases where such continued use will not constitute a hazard to life or adjoining property.

(h) Buildings and structures shall be dry and free from water seepage through the roof, walls, and floors.

(3) Storage of ammonium nitrate in bags, drums, or other containers.

(a) Bags and containers used for ammonium nitrate must comply with specifications and standards required for use in interstate commerce (see 49 CFR Chapter I).

(b) Containers used on the premises in the actual manufacturing or processing need not comply with provisions of (a) of this subsection.

(c) Containers of ammonium nitrate shall not be accepted for storage when the temperature of the ammonium nitrate exceeds 130°F (54.4°C).

(d) Bags of ammonium nitrate shall not be stored within 30 inches (76 cm) of the storage building walls and partitions.

(e) The height of piles shall not exceed 20 feet (6.1 m). The width of piles shall not exceed 20 feet (6.1 m) and the length 50 feet (15.2 m) except that where the building is of noncombustible construction or is protected by automatic sprinklers the length of piles shall not be limited. In no case shall the ammonium nitrate be stacked closer than 36 inches

(0.9 m) below the roof or supporting and spreader beams overhead.

(f) Aisles shall be provided to separate piles by a clear space of not less than 3 feet (0.9 m) in width. At least one service or main aisle in the storage area shall be not less than 4 feet (1.2 m) in width.

(4) Storage of bulk ammonium nitrate.

(a) Warehouses shall have adequate ventilation or be capable of adequate ventilation in case of fire.

(b) Unless constructed of noncombustible material or unless adequate facilities for fighting a roof fire are available, bulk storage structures shall not exceed a height of 40 feet (12.2 m).

(c) Bins shall be clean and free of materials which may contaminate ammonium nitrate.

(d) Due to the corrosive and reactive properties of ammonium nitrate, and to avoid contamination, galvanized iron, copper, lead, and zinc shall not be used in a bin construction unless suitably protected. Aluminum bins and wooden bins protected against impregnation by ammonium nitrate are permissible. The partitions dividing the ammonium nitrate storage from other products which would contaminate the ammonium nitrate shall be of tight construction.

(e) The ammonium nitrate storage bins or piles shall be clearly identified by signs reading "ammonium nitrate" with letters at least 2 inches (5 cm) high.

(f) Piles or bins shall be so sized and arranged that all material in the pile is moved out periodically in order to minimize possible caking of the stored ammonium nitrate.

(g) Height or depth of piles shall be limited by the pressure-setting tendency of the product. However, in no case shall the ammonium nitrate be piled higher at any point than 36 inches (0.9 m) below the roof or supporting and spreader beams overhead.

(h) Ammonium nitrate shall not be accepted for storage when the temperature of the product exceeds 130°F (54.4°C).

(i) Dynamite, other explosives, and blasting agents shall not be used to break up or loosen caked ammonium nitrate.

(5) Contaminants.

(a) Ammonium nitrate shall be in a separate building or shall be separated by approved type firewalls of not less than 1 hour fire-resistance rating from storage or organic chemicals, acids, or other corrosive materials, materials that may require blasting during processing or handling, compressed flammable gases, flammable and combustible materials or other contaminating substances, including but not limited to animal fats, baled cotton, baled rags, baled scrap paper, bleaching powder, burlap or cotton bags, caustic soda, coal, coke, charcoal, cork, camphor, excelsior, fibers of any kind, fish oils, fish meal, foam rubber, hay, lubricating oil, linseed oil, or other oxidizable or drying oils, naphthalene, oakum, oiled clothing, oiled paper, oiled textiles, paint, straw, sawdust, wood shavings, or vegetable oils. Walls referred to in this subsection need extend only to the underside of the roof.

(b) In lieu of separation walls, ammonium nitrate may be separated from the materials referred to in (a) of this subsection by a space of at least 30 feet (9.1 m).

(c) Flammable liquids such as gasoline, kerosene, solvents, and light fuel oils shall not be stored on the premises except when such storage conforms to WAC 296-24-330, and

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when walls and sills or curbs are provided in accordance with (a) or (b) of this subsection.

(d) LP-Gas shall not be stored on the premises except when such storage conforms to WAC 296-24-475.

(e) Sulfur and finely divided metals shall not be stored in the same building with ammonium nitrate except when such storage conforms to chapter 296-52 WAC and NFPA Std. 495, Explosive Materials Code.

(f) Explosives and blasting agents shall not be stored in the same building with ammonium nitrate except on the premises of makers, distributors, and user-compounders of explosives or blasting agents.

(g) Where explosives or blasting agents are stored in separate buildings, other than on the premises of makers, distributors, and user-compounders of explosives or blasting agents, they shall be separated from the ammonium nitrate by the distances and/or barricades specified in Table H-22 of WAC 296-52-481, but by not less than 50 feet (15.2 m).

(h) Storage and/or operations on the premises of makers, distributors, and user-compounders of explosives or blasting agents shall be in conformity with chapter 296-52 WAC.

(6) General precautions.

(a) Electrical installations shall conform to the requirements of chapter 296-24 WAC, Part L, for ordinary locations. They shall be designed to minimize damage from corrosion.

(b) In areas where lightning storms are prevalent, lightning protection shall be provided. (See the Lightning Protection Code, NFPA 78-1992.)

(c) Provisions shall be made to prevent unauthorized personnel from entering the ammonium nitrate storage area.

(7) Fire protection.

(a) Not more than 2,500 (2270 metric) tons of bagged ammonium nitrate shall be stored in a building or structure not equipped with an automatic sprinkler system. Sprinkler systems shall be of the approved type and installed in accordance with WAC 296-24-607.

(b) Suitable fire control devices such as small hose or portable fire extinguishers shall be provided throughout the warehouse and in the loading and unloading areas. Suitable fire control devices shall comply with the requirements of WAC 296-24-592 and 296-24-602.

(c) Water supplies and fire hydrants shall be available in accordance with recognized good practices.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-465, filed 3/6/95, effective 4/20/95; 91-03-044 (Order 90-18), § 296-52-465, filed 1/10/91, effective 2/12/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-465, filed 5/6/86.]

WAC 296-52-469 Storage of blasting agents and supplies. (1) Blasting agents or ammonium nitrate, when stored in conjunction with explosives, shall be stored in the manner set forth in WAC 296-52-453 (2)(a) for explosives. The mass of blasting agents and one-half the mass of ammonium nitrate shall be included when computing the total quantity of explosives for determining distance requirements.

(2) Blasting agents, when stored entirely separate from explosives, may be stored in the manner set forth in WAC 296-52-453 (5) and (6) or in one-story warehouses (without basements) which shall be:

(a) Noncombustible or fire resistive;

(b) Constructed so as to eliminate open floor drains and piping into which molten materials could flow and be confined in case of fire;

(c) Weather resistant;

(d) Well ventilated; and

(e) Equipped with a strong door kept securely locked except when open for business.

(3) Semitrailer or full-trailer vans used for highway or on-site transportation of the blasting agents are satisfactory for temporarily storing these materials, provided they are located in accordance with Table H-21 with respect to inhabited buildings, passenger railways, and public highways and according to Table H-22 with respect to one another. Trailers shall be provided with substantial means for locking, and the trailer doors shall be kept locked, except during the time of placement and removal of stocks of blasting agents.

(4) Warehouses used for the storage of blasting agents shall be located in accordance with the provisions of Table H-21 with respect to inhabited buildings, passenger railways, and public highways, and according to Table H-22 with respect to one another.

(5) If both blasting agents and ammonium nitrate are handled or stored within the distance limitations prescribed in Table H-21, one-half the mass of the ammonium nitrate shall be added to the mass of the blasting agent when computing the total quality of explosives for determining the proper distance.

(6) Smoking, matches, open flames, spark producing devices, and firearms are prohibited inside of or within 50 feet (15.2 m) of any warehouse used for the storage of blasting agents. Combustible materials shall not be stored within 50 feet (15.2 m) of warehouses used for the storage of blasting agents.

(7) The interior of warehouses used for the storage of blasting agents shall be kept clean and free from debris and empty containers. Spilled materials shall be cleaned up promptly and safely removed. Combustible materials, flammable liquids, corrosive acids, chlorates, or nitrates shall not be stored in any warehouse used for blasting agents unless separated therefrom by a fire resistive separation of not less than one hour resistance. The provisions of this subsection shall not prohibit the storage of blasting agents together with nonexplosive blasting supplies.

(8) Piles of ammonium nitrate and warehouses containing ammonium nitrate shall be adequately separated from readily combustible fuels.

(9) Caked oxidizers, either in bags or in bulk, shall not be loosened by blasting.

(10) Every warehouse used for the storage of blasting agents shall be under the supervision of a competent person who shall be not less than twenty-one years of age.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-469, filed 3/6/95, effective 4/20/95. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-469, filed 5/6/86.]

WAC 296-52-477 Quantity and distance table for separation between magazines. Magazines containing blasting caps and electric blasting caps shall be separated from other magazines containing like contents, or from mag-

azines containing explosives by distances in the following table.

TABLE H-21
QUANTITY AND DISTANCE TABLE FOR SEPARATION BETWEEN
MAGAZINES CONTAINING EXPLOSIVES

Pounds Over	Pounds Not Over	Separation Distance in Feet Between Magazines	
		Not Barricaded	Barricaded
2	5	12	6
5	10	16	8
10	20	20	10
20	30	22	11
30	40	24	12
40	50	28	14
50	75	30	15
75	100	32	16
100	125	36	18
125	150	38	19
150	200	42	21
200	250	46	23
250	300	48	24
300	400	54	27
400	500	58	29
500	600	62	31
600	700	64	32
700	800	66	33
800	900	70	35
900	1,000	72	36
1,000	1,200	78	39
1,200	1,400	82	41
1,400	1,600	86	43
1,600	1,800	88	44
1,800	2,000	90	45
2,000	2,500	98	49
2,500	3,000	104	52
3,000	4,000	116	58
4,000	5,000	122	61
5,000	6,000	130	65
6,000	7,000	136	68
7,000	8,000	144	72
8,000	9,000	150	75
9,000	10,000	156	78
10,000	12,000	164	82
12,000	14,000	174	87
14,000	16,000	180	90
16,000	18,000	188	94
18,000	20,000	196	98
20,000	25,000	210	105
25,000	30,000	224	112
30,000	35,000	238	119
35,000	40,000	248	124
40,000	45,000	258	129
45,000	50,000	270	135
50,000	55,000	280	140
55,000	60,000	290	145
60,000	65,000	300	150
65,000	70,000	310	155
70,000	75,000	320	160
75,000	80,000	330	165
80,000	85,000	340	170
85,000	90,000	350	175
90,000	95,000	360	180
95,000	100,000	370	185
100,000	110,000	380	195
110,000	120,000	410	205
120,000	130,000	430	215
130,000	140,000	450	225
140,000	150,000	470	235
150,000	160,000	490	245
160,000	170,000	510	255
170,000	180,000	530	265
180,000	190,000	550	275

TABLE H-21
QUANTITY AND DISTANCE TABLE FOR SEPARATION BETWEEN
MAGAZINES CONTAINING EXPLOSIVES

Pounds Over	Pounds Not Over	Separation Distance in Feet Between Magazines	
		Not Barricaded	Barricaded
190,000	200,000	570	285
200,000	210,000	590	295
210,000	230,000	630	315
230,000	250,000	670	335
250,000	275,000	720	360
275,000	300,000	770	385

- Note 1. The term "natural barricade" is defined in WAC 296-52-417.
- Note 2. Efficient artificial barricade is defined in WAC 296-52-417.
- Note 3. "Barricaded" means that a building containing explosives is effectually screened from a magazine, building, railway, or highway, either by a natural barricade, or by an artificial barricade of such height that a straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine, or building, or to a point 12 feet above the center of a railway or highway, will pass through such intervening natural or artificial barricade.
- Note 4. This table applies only to the permanent storage of commercial explosives. It is not applicable to transportation of explosives, or any handling or temporary storage necessary or incident thereto. It is not intended to apply to bombs, projectiles, or other heavily encased explosives.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-477, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-477, filed 3/6/95, effective 4/20/95; 90-03-029 (Order 89-20), § 296-52-477, filed 1/11/90, effective 2/26/90. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-477, filed 5/6/86.]

WAC 296-52-481 Recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents.

TABLE H-22
TABLE OF RECOMMENDED SEPARATION DISTANCES OF AMMONIUM NITRATE AND BLASTING AGENTS FROM EXPLOSIVES OR BLASTING AGENTS^{1, 6}

Donor weight		Minimum separation distance of receptor when barricaded ² (ft.)		Minimum thickness of artificial barricades ⁵ (in.)
Pounds over	Pounds not over	Ammonium nitrate ³	Blasting agent ⁴	
	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25
25,000	30,000	19	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35

Donor weight		Minimum separation distance of receptor when barricaded ² (ft.)		Minimum thickness of artificial barricades ⁵ (in.)
Pounds over	Pounds not over	Ammonium nitrate ³	Blasting agent ⁴	
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40
70,000	80,000	28	101	40
80,000	90,000	30	108	40
90,000	100,000	32	115	40
100,000	120,000	34	122	50
120,000	140,000	37	133	50
140,000	160,000	40	144	50
160,000	180,000	44	158	50
180,000	200,000	48	173	50
200,000	220,000	52	187	60
220,000	250,000	56	202	60
250,000	275,000	60	216	60
275,000	300,000	64	230	60

Notes to table of recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents:

- Note 1. These distances apply to the separation of stores only. Table H-20 shall be used in determining separation distances from inhabited buildings, passenger railways, and public highways.
- Note 2. When the ammonium nitrate and/or blasting agent is not barricaded, the distances shown in the table shall be multiplied by six. These distances allow for the possibility of high velocity metal fragments from mixers, hoppers, truck bodies, sheet metal structures, metal containers, and the like which may enclose the "donor." Where storage is in bullet-resistant magazines recommended for explosives or where the storage is protected by a bullet-resistant wall, distances, and barricade thicknesses in excess of those prescribed in Table H-20 are not required.
- Note 3. The distances in the table apply to ammonium nitrate that passes the insensitivity test prescribed in the definition of ammonium nitrate fertilizer promulgated by the Fertilizer Institute*; and ammonium nitrate failing to pass said test shall be stored at separation distances determined by competent persons. (*Definition and Test Procedures for Ammonium Nitrate Fertilizer, The Fertilizer Institute, formerly the National Plant Food Institute, November 1964.)
- Note 4. These distances apply to nitro-carbo-nitrates and blasting agents which pass the insensitivity test prescribed in the United States Department of Transportation (DOT) regulations.
- Note 5. Acceptable barricades include either natural or artificial barricades as defined in WAC 296-52-417.
- Note 6. When the ammonium nitrate must be counted in determining the distances to be maintained from inhabited buildings, passenger railways and public highways, it may be counted at one-half its actual weight because its blast effect is lower.
- Note 7. Guide to use of table of recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents.
 - (a) Sketch location of all potential donor and acceptor materials together with the maximum mass of material to be allowed in that vicinity. (Potential donors are high explosives, blasting agents, and combination of masses of detonating materials. Potential acceptors are high explosives, blasting agents, and ammonium nitrate.)

(b) Consider separately each donor mass in combination with each acceptor mass. If the masses are closer than table allowance (distances measured between nearest edges), the combination of masses becomes a new potential donor of weight equal to the total mass. When individual masses are considered as donors, distances to potential acceptors shall be measured between edges. When combined masses within propagating distance of each other are considered as a donor, the appropriate distance to the edge of potential acceptors shall be computed as a weighted distance from the combined masses:

(i) Calculation of weighted distance from combined masses:

Let M_2, M_3, \dots, M_n be donor masses to be combined.

M_1 is a potential acceptor mass.

D_{12} is distance from M_1 to M_2 (edge to edge).

D_{13} is distance from M_1 to M_3 (edge to edge), etc.

To find weighted distance $[D_{1(2,3,\dots,n)}]$ from combined masses to M_1 , add the products of the individual masses and distances and divide the total by the sum of the masses thus:

$$D_{1(2,3,\dots,n)} = \frac{M_2 \times D_{12} + M_3 \times D_{13} + \dots + M_n \times D_{1n}}{M_2 + M_3 + \dots + M_n}$$

Propagation is possible if either an individual donor mass is less than the tabulated distance from an acceptor or a combined mass is less than the weighted distance from an acceptor.

(c) In determining the distances separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H-20), the sum of all masses which may propagate (i.e., lie at distances less than prescribed in the Table) from either individual or combined donor masses are included. However, when the ammonium nitrate must be included, only 50 percent of its weight shall be used because of its reduced blast effects. In applying Table H-21 to distances from highways, railroads, and inhabited buildings, distances are measured from the nearest edge of potentially explodable material.

(d) When all or part of a potential acceptor comprises Explosives Class A as defined in DOT regulations, storage in bullet-resistant magazines is required. Safe distances to stores in bullet-resistant magazines may be obtained from the intermagazine distances prescribed in Table H-21.

(e) Barricades must not have line-of-sight openings between potential donors and acceptors which permit blast or missiles to move directly between masses.

(f) Good housekeeping practices shall be maintained around any bin containing ammonium nitrate or blasting agent. This includes keeping weeds and other combustible materials cleared within 25 feet of such bin. Accumulation of spilled product on the ground shall be prevented.

[Statutory Authority: Chapter 49.17 RCW, 95-07-014, § 296-52-481, filed 3/6/95, effective 4/20/95; 90-03-029 (Order 89-20), § 296-52-481, filed 1/11/90, effective 2/26/90. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-10-044 (Order 86-24), § 296-52-481, filed 5/6/86.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-52-485 Quantity and distance tables for manufacturing buildings. All explosives manufacturing buildings shall be located one from the other and from other buildings on explosives manufacturing plants in which persons are regularly employed, and all magazines shall be located from factory buildings and buildings on explosives plants in which persons are regularly employed, in conformity with the intraexplosives plant quantity and distance table below.

TABLE H-23

EXPLOSIVES		Distance Feet
Pounds Over	Pounds Not Over	
10	10	40
25	25	60
50	50	80
100	100	100
200	200	120
300	300	130
400	400	140
500	500	160
750	750	180
1,000	1,000	210
1,500	1,500	230
2,000	2,000	260
3,000	3,000	280
4,000	4,000	300
5,000	5,000	320
6,000	6,000	340
7,000	7,000	360
8,000	8,000	380
9,000	9,000	400
10,000	10,000	420
12,500	12,500	450
15,000	15,000	470
17,500	17,500	490
20,000	20,000	530
25,000	25,000	560
30,000	30,000	590
35,000	35,000	620
40,000	40,000	640
45,000	45,000	660
50,000	50,000	680
55,000	55,000	700
60,000	60,000	720
65,000	65,000	740
70,000	70,000	770
75,000	75,000	780
80,000	80,000	790
85,000	85,000	800
90,000	90,000	820
95,000	95,000	830
100,000	100,000	900
125,000	125,000	950
150,000	150,000	1,000
175,000	175,000	1,050
200,000	200,000	1,100
225,000	225,000	1,150
250,000	250,000	1,200
275,000	275,000	1,250
300,000	300,000	1,250

[Statutory Authority: RCW 49.17.040 and 49.17.050, 86-10-044 (Order 86-24), § 296-52-485, filed 5/6/86.]

WAC 296-52-487 Low explosives. (1) Magazines which are restricted to the storage of only Class C (low explosives) as defined in this chapter, or classified as low explosives by the Bureau of Alcohol, Tobacco and Firearms, may be located in accordance with Table H-24.

(2) Detonators shall not be stored with any other low explosives.

TABLE H-24
TABLE OF DISTANCES FOR STORAGE OF LOW
EXPLOSIVES

Pounds		From inhabited building distance	From public railroad and highway distance	From above ground magazine
Over	Not Over	(feet)	(feet)	(feet)
0	1,000	75	75	50
1,000	5,000	115	115	75
5,000	10,000	150	150	100
10,000	20,000	190	190	125
20,000	30,000	215	215	145
30,000	40,000	235	235	155
40,000	50,000	250	250	165
50,000	60,000	260	260	175
60,000	70,000	270	270	185
70,000	80,000	280	280	190
80,000	90,000	295	295	195
90,000	100,000	300	300	200
100,000	200,000	375	375	250
200,000	300,000	450	450	300

[Statutory Authority: Chapter 49.17 RCW, 95-07-014, § 296-52-487, filed 3/6/95, effective 4/20/95; 88-23-054 (Order 88-25), § 296-52-487, filed 11/14/88.]

PART E—EXPLOSIVES TRANSPORTATION

WAC 296-52-489 Transportation. (1) Regulations governing the transportation of explosives on public highways are adopted by the United States Department of Transportation (see 49 CFR Parts 100 through 199) and the Washington utilities and transportation commission and administered by the Washington state patrol.

(2) The regulations of this section shall be applicable in- and-on job sites and off-highway roads. The department of labor and industries shall administer these regulations in locations such as but not limited to: Construction or mining access roads and blast sites; off-highway forest roads including both publicly and privately owned logging roads, haul roads or general access roads.

Note: Examples of publicly owned off-highway roads where these regulations are applicable shall include, but are not limited to: U.S. Forest Service roads, Bureau of Land Management roads, state department of natural resources roads, but specifically not including the state or interstate highway system.

(a) No person shall be allowed to smoke, carry matches or any other flame-producing device, except guards or commissioned law enforcement officers, to carry any firearms or loaded cartridges while in or near a motor vehicle transporting explosives; or drive, load, or unload such vehicle in a careless or reckless manner.

(b) Explosives shall not be carried on any vehicle while vehicle is being used to transport workers other than driver and two persons.

(c) Explosives shall be transferred from a disabled vehicle to another, only when proper and qualified supervision is provided. Local fire and police departments shall be promptly notified in congested areas. In remote areas they shall be notified if appropriate.

(d) Other materials or supplies shall not be placed on or in the cargo space of a conveyance containing explosives,

detonating cord or detonators, except carrying safety fuse, and properly secured, nonsparking equipment used expressly in the handling of such explosives will be permissible.

(3) Transportation vehicles.

(a) All vehicles used for transporting explosives shall be strong enough to carry the load without difficulty and be in good mechanical condition. The cargo compartment(s) shall have a tight floor and must not have any exposed spark producing metal on the inside which could come into contact with explosives cargo.

(b) Explosives vehicles used on any roadway which is open to public travel shall comply with WAC 296-52-550, Appendix II.

(c) Open top explosives transportation vehicles may only be used on the jobsite or on roads which are not open to public travel (while laden with explosives). In open top vehicles or trailers, explosives may only be transported in the original DOT approved shipping container(s)/box(es) or a daybox or portable magazine which complies with the requirements of this chapter. In all instances the explosive container(s), box(es), daybox or portable magazine shall be secured to the bed of the vehicle or trailer.

(i) If an explosives transportation vehicle or trailer does not have a fully enclosed cargo area with nonsparking interior, the cargo bed and all explosive cargo shall be covered with a flameproof and moisture-proof tarpaulin or other effective protection against moisture and sparks. Whenever tarpaulins are used for covering explosives, both the tarpaulin and the explosives container shall be secured to the body of the truck bed by means of rope, wire, or other equally efficient tie downs.

(ii) Packages of explosives shall not be loaded above the sides on open-sided vehicles.

(4) Vehicles shall be placarded and displayed as specified by the United States Department of Transportation, CFR 49-1981, Parts 100 through 199. Placards shall remain on the vehicle until all explosives have been removed from the vehicle.

(5)(a) Each motor vehicle used for transporting explosives shall be equipped with a minimum of two extinguishers, each having a rating of at least 2A 10BC. The driver shall be trained in the use of the extinguishers on the vehicle.

(i) Only extinguishers listed or approved by a nationally recognized testing laboratory shall be deemed suitable for use on explosives-carrying vehicles. Refer to WAC 296-24-58501(19) for definition of listed, and federal regulation 29 CFR 1910.7 for nationally recognized testing laboratory.

(ii) Extinguishers shall be filled and ready for immediate use and readily available. Extinguishers shall be examined periodically by a competent person.

(b) A motor vehicle used for transporting explosives shall be given the following inspection to determine that it is in proper condition for safe transportation of explosives:

(i) Fire extinguishers shall be filled and in working order.

(ii) All electrical wiring shall be completely protected and securely fastened to prevent short-circuiting.

(iii) Chassis, motor, pan, and underside of body shall be reasonably clean and free of excess oil and grease.

(iv) Fuel tank and feedline shall be secure and have no leaks.

(v) Brakes, lights, horn, windshield wipers, and steering apparatus shall function properly.

(vi) Tires shall be checked for proper inflation and defects.

(vii) The vehicle shall be in proper condition in every other respect and acceptable for handling explosives.

(c) Motor vehicles or conveyances carrying explosives, blasting agents, or blasting supplies, shall not be taken inside a garage or shop for repairs or servicing.

(6) Operation of transportation vehicles.

(a) Vehicles transporting explosives shall only be driven by and be in the charge of a licensed driver who is not less than twenty-one years of age, physically fit, careful, capable, reliable, able to read and write the English language, and not addicted to the use, or under the influence of intoxicants, narcotics, or other dangerous drugs. This rule does not apply to persons taking prescription drugs and/or narcotics as directed by a physician providing such use shall not endanger the worker or others. They shall be familiar with the traffic regulations, state laws, and the provisions of this section.

(i) Explosives may only be transported by a licensed manufacturer, blaster, purchaser or seller, or the designated agent or representative thereof, or a contract carrier for hire who complies with all requirements for transportation of hazardous materials.

(ii) The person in control of the explosive laden vehicle shall be made aware of the nature of the cargo and pertinent safety precautions relating to the particular explosive(s) being transported.

(b) Parking. A motor vehicle which contains Class A or Class B explosives must not be parked under any of the following circumstances:

(i) On or within 5 feet of the traveled portion of a public street or highway;

(ii) On private property (including premises of a fueling or eating facility) without the knowledge and consent of the person who is in charge of the property and who is aware of the nature of the hazardous materials the vehicle contains; or

(iii) Within 300 feet of a bridge, tunnel, dwelling, building, or place where people work, congregate, or assemble, except for brief periods when the necessities of operation require the vehicle to be parked and make it impracticable to park the vehicle in any other place.

(c) Every motor vehicle transporting any quantity of Class A or Class B explosives shall, at all times, be attended by a driver or other attendant of the motor carrier. This attendant shall have been made aware of the class of the explosive material in the vehicle and of its inherent dangers, and shall have been instructed in the measures and procedures to be followed in order to protect the public from those dangers. The attendant shall have been made familiar with the vehicle to which assigned, and shall be trained, supplied with the necessary means, and authorized to move the vehicle when required.

(i) For the purpose of this subdivision, a motor vehicle shall be deemed "attended" only when the driver or other attendant is physically on or in the vehicle, or has the vehicle within the driver or attendants field of vision and can reach it quickly and without any kind of interference; "attended" also means that the driver or attendant is awake, alert, and not

engaged in other duties or activities which may divert their attention from the vehicle.

(ii) An explosive laden vehicle may be left unattended for a period not to exceed 48 hours provided that:

(A) The vehicle is parked in a designated parking lot which complies with NFPA Std. 498 and with the appropriate clearance table of this chapter for the type and quantity of explosives carried;

(B) The designated parking lot is correctly bermed and walled or fenced and gated to prevent unauthorized entry;

(C) The designated lot is inspected and approved by the department of labor and industries and is provided with a full-time security patrol at all times when explosives are present;

(D) Trucks used for explosives delivery which contain only blasting agents (International Class 1.5 D) and no high explosives need not be attended provided the vehicle is locked to prevent movement of the vehicle, the cargo compartments are locked to prevent theft, the vehicle is parked according to all applicable storage distance requirements, and the vehicle is located in a secured area which restricts entry to the area by unauthorized personnel.

(d) No spark-producing metal, spark-producing tools, oils, matches, firearms, electric storage batteries, flammable substances, acids, oxidizing materials, or corrosive compounds shall be carried in the body of any motor truck and/or vehicle transporting explosives, unless the loading of such dangerous articles and the explosives comply with U.S. Department of Transportation regulations.

(e) Vehicles transporting explosives shall avoid congested areas and heavy traffic.

(f) Delivery and issue of explosives shall only be made by and to authorized persons and into authorized magazines or authorized temporary storage or handling area.

(7) Transporting blasting caps and explosives in the same vehicle.

(a) Fuse type blasting caps, blasting caps with safety fuse and/or blasting caps with metal clad mild detonating fuse shall not be transported over the highways on the same vehicle or trailer with other explosives, unless packaged, segregated, and transported in accordance with the department of transportation's hazardous materials regulations.

(b) Blasting caps rated by U.S. DOT as nonmass detonating may be transported in the same vehicle or trailer with other explosives when:

(i) The caps are carried in DOT approved shipping containers:

(ii) The truck or trailer complies with Appendix 1, WAC 296-52-550.

(8) When primers are made up at a central primer house for use in high speed tunneling, the following shall apply:

(a) Only enough primers shall be made up for each round of blasting.

(b) The primers shall be placed in separate containers or bins, categorized by degree of delay in such a manner so as to prevent them from physical impact.

(c) Explosives carried in the same magazine shall be separated by 1/4-inch steel, covered on each side by four inches of hardwood planking, or equivalent.

(d) Hoist operators shall be notified before explosives or blasting agents are transported in a shaft conveyance.

(e) Explosives and blasting agents shall be hoisted, lowered, or conveyed in a powder car. No other materials, supplies, or equipment shall be transported in the same conveyance at the same time.

(f) Only a state approved powder car or conveyance shall be used underground.

(g) All explosives or blasting agents in transit underground shall be taken to the place of use or storage without delay.

(h) The quantity of explosives or blasting agents taken to an underground loading area shall not exceed the amount estimated to be necessary for the blast.

(i) The number of primers for one round will be removed from the state approved car or vehicle at the face or heading after the drilling has been completed and the holes readied for loading. After loading the charge, the powder car or vehicle will be withdrawn from the tunnel.

(j) Wires on electric caps shall be kept shunted until wired to the bus wires.

(k) The powder car or conveyance shall be inspected daily for lights, brakes and external damage to electrical circuitry. The electrical system shall be checked weekly to detect any failures that may constitute an electrical hazard and a written certification record of such inspection shall be kept on file for the duration of the job. The certification record shall contain the date of inspection, the serial number or other positive identification of the unit being inspected and the signature of the person performing the inspection.

(l) The installation of auxiliary lights on truck beds, which are powered by the truck's electrical system, shall be prohibited.

(m) No one, except the operator, the helper, and/or the powderperson, shall be permitted to ride on a conveyance transporting explosives and blasting agents.

(n) No person shall ride in any shaft conveyance transporting explosives and blasting agents.

(o) No explosives or blasting agents shall be transported on a crew-haul trip.

(p) The car or conveyance containing explosives or blasting agents shall be pulled, not pushed, whenever possible.

(q) The powder car or conveyance especially built for the purpose of transporting explosives or blasting agents shall bear a reflectorized sign on each side with the word "explosives" in letters not less than 4 inches in height; upon a background of sharply contrasting color.

(r) Compartments for transporting detonators and explosives in the same car or conveyance shall be physically separated by a distance of 24 inches or by a solid partition at least 6 inches thick.

(s) Detonators and other explosives shall not be transported at the same time in any shaft conveyance.

(t) Explosives and/or blasting agents, not in original containers, shall be placed in a suitable container when transported manually.

(u) No explosives or blasting agents shall be transported on any locomotive. At least two car lengths shall separate the locomotive from the powder car.

(9) When explosives are carried to the blasting site from the main storage magazines by the blaster or helper:

(a) Special insulated containers or original DOT shipping containers shall be used for this purpose, either boxes or bags, one container for explosives and one for detonators.

(b) Detonators or explosives shall never be carried in pockets of clothing.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-489, filed 8/17/99, effective 12/1/99. Statutory Authority: RCW 49.17.040. 98-19-056, § 296-52-489, filed 9/15/98, effective 11/8/98. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-489, filed 3/6/95, effective 4/20/95; 92-17-022 (Order 92-06), § 296-52-489, filed 8/10/92, effective 9/10/92; 91-03-044 (Order 90-18), § 296-52-489, filed 1/10/91, effective 2/12/91; 88-23-054 (Order 88-25), § 296-52-489, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-489, filed 5/6/86.]

PART F—USE OF EXPLOSIVES

WAC 296-52-493 Use of explosives and blasting agents. (1) General provisions.

(a) While explosives are being handled or used, smoking, matches, or any other source of fire or flame shall not be allowed within 100 feet of the blast site. No person shall be allowed to handle explosives while under the influence of intoxicating liquors, narcotics, or other dangerous drugs. This rule does not apply to persons taking prescription drugs and/or narcotics as directed by a physician providing such use shall not endanger the worker or others.

(b) Original containers or day box magazines shall be used for taking detonators and other explosives from storage magazines to the blast site.

(c) When blasting is done in congested areas or in close proximity to a structure, railway, or highway or any other installation that may be damaged, the blast shall be covered before firing with a mat or other suitable protective material that is capable of preventing fragments from being thrown.

(d) Persons authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution, including but not limited to warning signals, flags and barricades or blasting mats to insure the safety of the general public and workers.

(e) Blasting operations shall be conducted during daylight hours whenever possible.

(f) Whenever blasting is being conducted in the vicinity of gas, electric, water, fire alarm, telephone, telegraph, and steam utilities, the user (blaster) shall notify the appropriate representatives of such utilities at least twenty-four hours in advance of blasting, specifying the location and intended time of such blasting. Verbal notice shall be confirmed with written notice. The blaster shall ensure that appropriate measures for safe control have been taken.

(g) Due precaution shall be taken to prevent unintended discharge of blasting caps from extraneous electric current or from transmitted radio frequency (RF) energy. Examples:

Common sources of extraneous electricity include but are not limited to adjacent powerlines, dust storms and lightning storms.

Common sources of hazardous RF transmissions include but are not limited to: (MOBILE) citizen band (CB) or side band radio transmitters, VHF (FM) radio transmitters, UHF cellular telephones and radar transmitters. (FIXED LOCATION TRANSMITTERS) base stations for CB, side band or

FM radio communications, UHF cellular telephone transmitters and service extension repeater systems, AM and FM (commercial) radio broadcast transmitters, TV broadcast transmitters and repeater system transmitters, surface scan and radio navigation beacons.

(h) Low flying aircraft and in particular military aircraft create the most common serious RF exposures. These highly unpredictable mobile transmitters are very powerful and transmit on a broad spectrum of frequencies including radar, laser and all common communications bands. Probably the two most dangerous examples are low flying automatic terrain following guidance systems and airplanes which are equipped to jam all common radar and communications frequencies for a distance of several miles around the airborne transmitters.

(i) Precautions to prevent unintended discharge of electric blasting caps from extraneous electric currents or RF transmission shall include:

(i) Positive identification of voltages in electrical transmission and distribution lines and specific required clearance for each specific system; and

(ii) Complete suspension of all blasting operations and removal of all personnel from the blast site during the approach and progress of heavy dust storms which may create static lightning or conventional thunder and lightning storms; and

(iii) The posting of signs warning against the use of radio frequency transmitters including CBs, mobile phones and two-way radios. The required signs shall be placed in a manner to adequately warn transmitter users, including all routes into the required clearance zone around where electric blasting caps are used.

(A) The required clearance zone for construction and/or demolition operations shall be 1000 feet;

(B) The required clearance zone for general industry operations which are not subject to construction requirements shall be 350 feet.

Note: See Appendix II, WAC 296-52-552 for illustrations and specific posting requirements.

(iv) Ensuring that mobile RF transmitters which are less than 100 feet away from electrical blasting caps are deenergized or disconnected when the caps are not fully contained in the original DOT shipping containers; and

(v) Fixed location RF transmitters represent a higher level of hazard to both storage and/or blasting operations involving electric caps because the transmitters are more powerful and transmit dangerous levels of RF exposure over much greater distances. Storage or blasting operations with electric caps shall only be carried out in full compliance with the appropriate recommended distance tables published in *INSTITUTE OF MAKERS OF EXPLOSIVES (I.M.E.) Publication No. 20, 1988, "SAFETY GUIDE FOR THE PREVENTION OF RADIO FREQUENCY HAZARDS IN THE USE OF COMMERCIAL ELECTRIC DETONATORS (Blasting Caps)"*; and

(vi) When necessary to conduct blasting operations within the required separation distances specified in I.M.E. Pamphlet 20-1988, the storage and use of electric blasting caps shall be prohibited on the site and only detonating cord,

safety fuse, shock tube or other approved nonelectric systems may be used.

(j) No fire shall be fought where the fire is in imminent danger of contact with explosives. All employees shall be removed to a safe area and the fire area guarded against intruders.

(k) Electric detonators shall be shunted until wired into the blasting circuit.

(l) Explosives shall not be handled near open flames, uncontrolled sparks or energized electric circuits.

(m) Delivery and issue of explosives shall only be made by and to authorized persons and into authorized magazines or approved temporary storage or handling area.

(n) Blaster in charge.

(i) The blast site shall be under the control of a fully qualified and currently licensed "blaster in charge" throughout the course of every blasting operation. That obligation shall commence with a site survey to determine potential safety conflicts with: Public utility transmission systems, dwellings or other occupied buildings, roads or railroads, radio frequency transmitters, preexisting explosives storage magazines.

(ii) Whenever the site survey identifies conditions which conflict with safe blasting operations, the blaster in charge shall prepare a written site blasting plan before beginning blasting operations. The written plan shall identify the methods, materials, procedures and/or engineering calculations which will be used to address each identified conflicting condition.

Note 1. When the site survey identifies that no conflicting conditions exist, a written blasting plan is not required.

Note 2. Written blasting plans may be discarded at the end of a job provided that no blasting incident has occurred which resulted in bodily injury or property damage.

(iii) All on-site transportation, storage, loading and firing of explosives shall be supervised by the blaster in charge. Trainees and inexperienced personnel shall work only under direct supervision of licensed personnel fully qualified in the blasting method in use, including safety procedures and blasting signals in use at that site.

(iv) The site blasting plan shall include designated safe location(s) for personnel during actual blasting and a method for determining when all personnel are accounted for in the designated safe location(s).

Note: It is desirable that all potential means of egress into the blast site should be under observation immediately prior to each blast. The observer(s) should be provided with a means of communication with the blaster in charge.

(o) The employer shall permit only competent and authorized personnel to handle explosives.

(p) No explosive shall be loaded or used underground in the presence of combustible gases or combustible dusts unless approved as permissible by MSHA.

(q) In either electric or nonelectric blasting, the firing line(s) shall not be connected to the blast initiating device until all personnel have been accounted for and removed from the blast danger area or are in a blast shelter or other location which affords adequate protection.

(2) Storage at use sites.

(a) Empty boxes and paper and fiber packing materials which have previously contained explosive materials shall be disposed of in a safe manner, or reused in accordance with the department of transportation's hazardous materials regulations.

(b) When opening kegs or wooden cases, no sparking metal tools shall be used; wooden wedges and either wood, fiber or rubber mallets shall be used. Nonsparking metallic slitters may be used for opening fiberboard cases.

(c) Should cartridges or packages of explosives show signs of deterioration, the manufacturer or the department shall be notified. Such explosives must be carefully set aside and properly disposed of.

(3) Loading of explosives or blasting agents in blast holes.

(a) Procedures that permit safe and efficient loading shall be established before loading is started.

(b) All drill holes shall be sufficiently large to admit freely the insertion of the cartridges of explosives. Holes shall be checked prior to loading to determine depth and conditions.

(c) Tamping shall be done only with wood rods or with approved plastic tamping poles without exposed metal parts, but nonsparking metal connectors may be used for jointed poles. Violent tamping shall be avoided. The primer shall never be tamped.

(d) No holes shall be loaded except those to be fired in the next round of blasting. After loading, all remaining explosives and detonators shall be immediately returned to an authorized magazine or day box.

(e) Drilling shall not be started until all remaining butts of old holes are examined for unexploded charges, and if any are found, they shall be refired before work proceeds.

(f) When a charge of explosives has been exploded in a bore hole to enlarge or "spring" it, an interval of at least two hours must be allowed to pass before an additional charge of explosives can be loaded into the hole.

Note: There may be an exception made to this rule provided the sprung hole is thoroughly wet down with water before it is loaded.

(g) No person shall be allowed to deepen drill holes which have contained explosives or blasting agents.

(h) No explosives or blasting agents shall be left unattended at blast sites unless stored in a licensed magazine.

(i) Users (blasters) shall not load, store or use explosives closer than the length of the steel being used for drilling and in no event nearer than fifty feet of drilling operations.

(j) Machines and all tools not used for loading explosives into bore holes shall be removed from the immediate location of holes being loaded with explosives. Equipment shall not be operated within 50 feet of loaded holes except when equipment is needed to add burden, mats or tracking of drills out of the loading area.

(k) Powerlines and portable electric cables for equipment being used shall be kept a safe distance from explosives or blasting agents being loaded into drill holes. Cables in the proximity of the blast area shall be deenergized and locked out by the blaster.

(l) Holes shall not be drilled where there is danger of intersecting a charged or misfired hole.

(m) All blast holes in open work shall be stemmed to the collar or to a point which will confine the charge.

(n) No explosives for underground operations other than those in Fume Class 1, as set forth by the Institute of Makers of Explosives, shall be used; however, explosives complying with the requirements of Fume Class 2 and Fume Class 3 may be used if adequate ventilation has been provided.

(o) Warning signs, indicating a blast area, shall be maintained at all approaches to the blast area. The warning sign lettering shall not be less than 4 inches in height on a contrasting background. All loaded stumps must be marked for identification on logging sites.

(p) A bore hole shall never be sprung when it is adjacent to or near a hole which has been loaded. Flashlight batteries shall not be used as a power source (blasting machine) for springing holes.

(q) No loaded holes shall be left unattended or unprotected.

(r) The user (blaster) shall keep an accurate, up-to-date record of explosives, blasting agents, and blasting supplies used in a blast and shall keep an accurate running inventory of all explosives and blasting agents stored on the operation.

(s) When loading blasting agents pneumatically over primed boosters, semiconductive delivery hose shall be used and the equipment shall be bonded and grounded.

(4) Initiation of explosive charges - electric blasting.

(a) Blasting cap leg wires shall be kept short-circuited (shunted) until they are connected into the circuit for firing.

(b) Before adopting any system of electrical firing, the user (blaster) shall conduct a thorough survey for extraneous currents, and all dangerous currents shall be eliminated before any holes are loaded.

(c) In any single blast using electric blasting caps, all caps shall be of the same style or function and be of the same manufacture and compatible with each other.

(d) Electric blasting shall be carried out by using blasting circuits or power circuits in accordance with the electric blasting cap manufacturer's recommendations.

(e) The firing line shall be checked with an approved testing device at the terminals before being connected to the blasting machine or other power source.

(f) The circuit including all caps shall be tested with an approved testing device before being connected to the firing line.

(g) When firing a circuit of electric blasting caps, care shall be exercised to ensure that an adequate quantity of delivered current is available, in accordance with the manufacturer's recommendations.

(h) Connecting wires and lead wires shall be insulated single solid wires of sufficient current-carrying capacity, and shall not be less than twenty gauge (American wire gauge) solid core insulated wire.

(i) Firing line or lead wires shall be solid single wires of sufficient current-carrying capacity, and shall be not less than fourteen gauge (American wire gauge) solid core insulated wire. Bus wires - depends on the size of the blast, fourteen gauge (American wire gauge) copper is recommended.

(j) The ends of lead wires which are to be connected to a firing device shall be shorted by twisting them together or otherwise shunting them before they are connected to the leg

wires or connecting wires, and they shall be kept in the control of the person who is doing the loading until loading is completed and the leg wires attached. Lead wires shall not be attached to the firing device until the blaster is ready to fire the shot and must be attached by the user (blaster) themselves.

(k) The ends of the leg wires on electric detonators shall be shorted in a similar manner and not separated other than for testing until all holes are loaded and the loader is ready to connect the leg wires to the connecting wires or lead wires.

(l) When firing electrically, the insulation on all firing lines shall be adequate and in good condition.

(m) A power circuit used for firing electric blasting caps shall not be grounded.

(n) In underground operations when firing from a power circuit, a safety switch shall be placed at intervals in the permanent firing line. This switch shall be made so it can be locked only in the "off" position and shall be provided with a short-circuiting arrangement of the firing lines to the cap circuit.

(o) In underground operations there shall be a "lightning" gap of at least 5 feet in the firing system ahead of the main firing switch; that is, between this switch and the source of power. This gap shall be bridged by a flexible jumper cord just before firing the blast.

(p) When firing from a power circuit, the firing switch shall be locked in the open or "off" position at all times, except when firing. It shall be so designed that the firing lines to the cap circuit are automatically short-circuited when the switch is in the "off" position. Keys to this switch shall be entrusted only to the user (blaster).

(q) Blasting machines shall be in good condition and the efficiency of the machine shall be tested periodically to make certain that it can deliver power at its rated capacity.

(r) When firing with blasting machines, the connections shall be made as recommended by the manufacturer of the electric blasting caps used.

(s) The number of electric blasting caps connected to a blasting machine shall not be in excess of its rated capacity. Furthermore, in primary blasting, a series circuit shall contain no more caps than the limits recommended by the manufacturer of the electric blasting caps in use.

(t) The blaster in charge shall be in charge of the blasting machines, and no other person shall connect the lead wires to the machine.

(u) Users (blasters), when testing circuits to charged holes, shall use only blasting testers especially designed for this purpose.

(v) Whenever the possibility exists that a lead line or blasting wire might be thrown over live overhead powerlines, communication lines, utility services, or other services or structures by the force of an explosion, care shall be taken to see that the total length of wires are kept too short to hit the lines, that the wires are securely anchored to the ground and owners or operators are notified. If those requirements can not be satisfied, a nonelectric system shall be used.

(w) In electrical firing, only the person making lead wire connections shall fire the shot. All connections shall be made from the bore hole back to the source of firing current, and the lead wires shall remain shorted and not be connected to

the blasting machine or other source of current until the charge is to be fired.

(x) After firing an electric blast from a blasting machine, the leading wires shall be immediately disconnected from the machine and short-circuited.

(y) When electric blasting caps have been used, workers shall not return to misfired holes for at least thirty minutes.

(5) Use of safety fuse.

(a) A fuse that is deteriorated or damaged in any way shall not be used.

(b) The hanging of fuse on nails or other projections which will cause a sharp bend to be formed in the fuse is prohibited.

(c) Before capping safety fuse, a short length shall be cut from the end of the supply reel so as to assure a fresh cut end in each blasting cap.

(d) Only a cap crimper of approved design shall be used for attaching blasting caps to safety fuse. Crimpers shall be kept in good repair and accessible for use.

(e) No unused cap or short capped fuse shall be placed in any hole to be blasted; such unused detonators shall be removed from the working place and disposed of or stored in licensed magazine.

(f) No fuse shall be capped, or primers made up, in any magazine or near any possible source of ignition.

(g) Capping of fuse and making of primers shall only be done in a place selected for this purpose and at least one hundred feet distant from any storage magazine.

(h) Fuse must be cut long enough to reach beyond the collar of the bore hole and in no case less than three feet. When shooting choker holes, not less than three feet of fuse shall be used.

(i) At least two persons shall be present when multiple cap and fuse blasting is done by hand lighting methods.

(j) Not more than 12 fuses shall be lighted by each blaster when hand lighting devices are used. However, when two or more safety fuses in a group are lighted as one by means of igniter cord, or other similar fuse-lighting devices, they may be considered as one fuse.

(k) The so-called "drop fuse" method of dropping or pushing a primer or any explosive with a lighted fuse attached is prohibited.

(l) Cap and fuse shall not be used for firing mudcap charges unless charges are separated sufficiently to prevent one charge from dislodging other shots in the blast.

(m) When blasting with safety fuses, consideration shall be given to the length and burning rate of the fuse. Sufficient time, with a margin of safety, shall always be provided for the blaster to reach a place of safety.

(n) The burning rate of the safety fuse in use at any time shall be measured, posted in conspicuous locations, and brought to the attention of all workers concerned with blasting. No fuse shall be used that burns faster than one foot in forty seconds or slower than one foot in fifty-five seconds.

(o) For use in wet places the joint between the cap and fuse shall be waterproofed with a compound prepared for this purpose.

(p) In making up primers only nonsparking skewers shall be used for punching the hole in the cartridge to insert the capped fuse. No blasting cap shall be inserted in the explo-

sives without first making a hole in the cartridge of proper size or using a standard cap crimper.

(q) Only sufficient primers for one day's use shall be made up at one time. They shall be stored in a box type magazine in which no other explosives are stored.

(r) Any loose cartridges of explosives, detonators, primers and capped fuse unused at the end of the shift shall be returned to their respective magazines and locked up.

(s) Safety fuse and caps shall only be used for conventional blasting where:

(i) Extraneous electricity or radio frequency transmissions make the use of electric cap and wire systems dangerous;

(ii) Overhead electric transmission lines cannot be deenergized and there is danger that blasting wires may be thrown into the overhead lines during a blast;

(iii) For avalanche control hand charges;

(iv) For specialized applications where cap and fuse is more suitable than electric or other nonelectric initiation systems.

(6) Use of detonating cord.

(a) Care shall be taken to select a detonating cord consistent with the type and physical condition of the bore hole and stemming and the type of explosives used.

(b) Detonating cord shall be handled and used with the same respect and care given other explosives.

(c) For quantity and distance purposes detonating fuse up to 60 grains per foot should be calculated as equivalent to 9 lbs. of high explosives per 1,000 feet. Heavier cord loads should be rated proportionately.

(d) Trunk lines in multiple-row blasts shall make one or more complete loops, with cross-ties between loops at intervals of not over two hundred feet.

(e) All detonating cord knots shall be tight and all connections shall be kept at right angles to the trunk lines.

(f) The line of detonating cord extending out of a bore hole or from a charge shall be cut from the supply spool before loading the remainder of the bore hole or placing additional charges.

(g) Detonating cord shall be handled and used with care to avoid damaging or severing the cord during and after loading and hooking-up.

(h) Detonating cord connections shall be competent and positive in accordance with approved and recommended methods. Knot-type or other cord-to-cord connections shall be made only with detonating cord in which the explosive core is dry.

(i) All detonating cord trunklines and branchlines shall be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation.

(j) All detonating cord connections shall be inspected before firing the blast.

(k) When detonating cord millisecond-delay connectors or short-interval-delay electric blasting caps are used with detonating cord, the practice shall conform strictly to the manufacturer's recommendations.

(l) When connecting a blasting cap or an electric blasting cap to detonating cord, the cap shall be taped or otherwise attached securely along the side or the end of the detonating

cord, with the end of the cap containing the explosive charge pointed in the direction in which the detonation is to proceed.

(m) Detonators for firing the trunkline shall not be brought to the loading area nor attached to the detonating cord until everything else is in readiness for the blast.

(7) Initiation of explosive charges - nonelectric blasting.

(a) All nonelectric initiation systems and components of these systems shall be used in accordance with their manufacturer's recommendations and instructions.

(b) All members of the blasting crew shall be instructed in the safe use of the initiation system and its components. It shall be the duty of the blaster in charge to provide adequate on-the-job training and supervision in the safe use of such systems.

(c) When a nonelectric shock tube initiation system is used, the tubing shall be free of all knots and tight kinks. The shock tube shall be free of cuts or abrasions that could expose the core to moisture.

(d) All blasting operations shall cease during the approach and progress of a thunderstorm, regardless of the type of initiation system used, and all personnel shall withdraw to a place of safety.

(e) When an explosive bulk truck or other vehicle is operated on a blast site, care shall be taken to ensure that the vehicle does not tread on the tubing, connectors, or any surface delay component. If a vehicle operated on a blast site must pass over loaded blastholes, precautions shall be made to consolidate these elements at the collar of the hole to prevent vehicle contact.

(f) Before firing the shot, the blaster in charge shall make a visual inspection to ensure that the initiation system is hooked up in accordance with the manufacturer's recommendations.

(8) Firing the blast.

(a) A code of blasting signals equivalent to Table T-1 shall be posted on one or more conspicuous places at the operation, and all employees shall be required to familiarize themselves with the code and conform to it. Warning signs shall be placed at suitable locations.

(b) All charges shall be covered with blasting mats or other protective material before firing, where blasting may cause injury or damage by flying rock or debris.

(c) Before a blast is fired, a loud warning signal shall be given by the blaster in charge, who has made certain that all surplus explosives are in a safe place and all employees, vehicles, and equipment are at a safe distance, or under sufficient cover.

(d) Flaggers shall be safely stationed on highways which pass through the danger zone so as to stop traffic during blasting operations.

(e) It shall be the duty of the blaster to fix the time of blasting. The blaster shall conduct all blasting operations and no shot shall be fired without the blaster's approval.

(f) Before firing an underground blast, warning shall be given, and all possible entries into the blasting area, and any entrances to any working place where a drift, raise, or other opening is about to hole through, shall be carefully guarded. The blaster shall make sure that all employees are out of the blast area before firing a blast.

TABLE T-1

WARNING SIGNAL	— A 1-minute series of long blasts 5 minutes prior to blast signal.
BLAST SIGNAL	— A series of short blasts 1 minute prior to the shot.
ALL CLEAR SIGNAL	— A prolonged blast following the inspection of blast area.

(9) Inspection after blasting.

(a) Immediately after the blast has been fired, the firing line shall be disconnected from the blasting machine, or where power switches are used, they shall be locked open or in the off position.

(b) Sufficient time shall be allowed, not less than fifteen minutes in tunnels, for the smoke and fumes to leave the blasted area before returning to the shot. An inspection of the area and the surrounding rubble shall be made by the user (blaster) to determine if all charges have been exploded before employees are allowed to return to the operation, and in tunnels, after the muck pile has been wetted down.

(10) Misfires.

(a) If a misfire is found, the user (blaster) shall provide proper safeguards for excluding all employees or other personnel from the danger zone.

(b) No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.

(c) No attempt shall be made to extract explosives from any charged or misfired hole; a new primer shall be put in and the hole reblasted. If refiring of the misfired hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is under water, blown out with air.

(d) If there are any misfires while using cap and fuse, all employees shall remain away from the charge for at least one hour. Misfires shall be handled under the direction of the person in charge of the blasting.

(e) When electric blasting caps have been used, workers shall not return to misfired holes for at least thirty minutes. All wires shall be carefully traced and a search made for unexploded charges.

(f) If explosives are suspected of burning in a hole, all persons in the endangered area shall move to a safe location and no one shall return to the hole until the danger has passed, but in no case within one hour.

(g) No drilling, digging, or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.

(11) Underwater blasting.

(a) A user (blaster) shall conduct all blasting operations, and no shot shall be fired without the blaster's approval.

(b) Loading tubes and casings of dissimilar metals shall not be used because of possible electric transient currents from galvanic action of the metals and water.

(c) Only water-resistant initiation systems shall be used for underwater blasting. Loading shall be done through a nonsparking loading tube when tube is necessary.

(d) No blast shall be fired while any vessel under way is closer than 1,500 feet to the blasting area. Those on board

vessels or craft moored or anchored within 1,500 feet shall be notified before a blast is fired.

(e) No blast shall be fired while any swimming or diving operations are in progress in the vicinity of the blasting area. If such operations are in progress, signals and arrangements shall be agreed upon to assure that no blast shall be fired while any persons are in the water.

(f) Blasting flags shall be displayed.

(g) The storage and handling of explosives aboard vessels used in underwater blasting operations shall be according to provisions outlined herein on handling and storing explosives.

(h) When more than one charge is placed under water, a float device shall be attached to an element of each charge in such manner that it will be released by the firing. Misfires shall be handled in accordance with the requirements of WAC 296-52-493(10).

(12) Blasting in excavation work in pressurized air locks.

(a) Detonators and explosives shall not be stored or kept in tunnels, shafts, or caissons. Detonators and explosives for each round shall be taken directly from the magazines to the blasting zone and immediately loaded. Detonators and explosives left over after loading a round shall be removed from the working chamber before the connecting wires are connected up. Explosives in transit shall not be left unattended.

(b) When detonators or explosives are brought into an air lock, no employee except the powderperson, user (blaster), lock tender and the employees necessary for carrying, shall be permitted to enter the air lock. No material, supplies, or equipment shall be brought through with the explosives.

(c) Primers, detonators and explosives shall be taken separately into pressure working chambers.

(d) The user (blaster) or powderperson shall be responsible for the receipt, unloading, storage, and on-site transportation of explosives and detonators.

(e) All metal pipes, rails, air locks, and steel tunnel lining shall be electrically bonded together and grounded at or near the portal or shaft, and such pipes and rails shall be cross-bonded together at not less than 1,000-foot intervals throughout the length of the tunnel. In addition, each air supply pipe shall be grounded at its delivery end.

(f) The explosives suitable for use in wet holes shall be water-resistant and shall be Fume Class 1, or other approved explosives.

(g) When tunnel excavation in rock face is approaching mixed face, and when tunnel excavation is in mixed face, blasting shall be performed with light charges and with light burden on each hole. Advance drilling shall be performed as tunnel excavation in rock face approaches mixed face, to determine the general nature and extent of rock cover and the remaining distance ahead to soft ground as excavation advances.

(13) Vibration and damage control. Blasting operations in or adjacent to cofferdams, piers, underwater structures, buildings, structures, or other facilities shall be carefully planned with full consideration for all forces and conditions involved.

(14) Black blasting powder shall not be used for blasting.

(15) No person shall store, handle, or transport explosives or blasting agents when such storage, handling, and

transportation of explosives or blasting agents constitutes an undue hazard to life.

(16) It shall be unlawful for any person to abandon explosives or explosive substances.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-52-493, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-493, filed 3/6/95, effective 4/20/95; 92-17-022 (Order 92-06), § 296-52-493, filed 8/10/92, effective 9/10/92; 91-03-044 (Order 90-18), § 296-52-493, filed 1/10/91, effective 2/12/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-493, filed 5/6/86.]

WAC 296-52-497 Blasting agents. (1) General. Unless otherwise set forth in this section, blasting agents, excluding water gels, shall be transported, stored, and used in the same manner as explosives. Water gels are covered in WAC 296-52-501.

(2) Fixed location mixing.

(a) Buildings or other facilities used for mixing blasting agents shall be located, with respect to inhabited buildings, passenger railroads, and public highways, in accordance with Table H-20. In determining the distance separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H-20), the sum of all masses which may propagate (i.e., lie at distances less than prescribed in Table H-22) from either individual or combined donor masses are included. However, when the ammonium nitrate must be included, only fifty percent of its weight shall be used because of its reduced blast effects.

(b) Buildings used for the mixing of blasting agents shall conform to the requirements of this section.

(i) Buildings shall be of noncombustible construction or sheet metal on wood studs.

(ii) Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

(iii) All fuel oil storage facilities shall be separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building.

(iv) The building shall be well ventilated.

(v) Heating units which do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be located outside the mixing building.

(vi) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a fire-wall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

(c) Equipment used for mixing blasting agents shall conform to the requirements of this subsection.

(i) The design of the mixer shall minimize the possibility of frictional heating, compaction, and especially confinement. All bearings and drive assemblies shall be mounted outside the mixer and protected against the accumulation of dust. All surfaces shall be accessible for cleaning.

(ii) Mixing and packaging equipment shall be constructed of materials compatible with the fuel-ammonium nitrate composition.

(iii) Suitable means shall be provided to prevent the flow of fuel oil to the mixer in case of fire. In gravity flow systems an automatic spring-loaded shutoff valve with fusible link shall be installed.

(d) The provisions of this subsection shall be considered when determining blasting agent compositions.

(i) The sensitivity of the blasting agent shall be determined by means of a No. 8 test blasting cap at regular intervals and after every change in formulation.

(ii) Oxidizers of small particle size, such as crushed ammonium nitrate prills or fines, may be more sensitive than coarser products and shall, therefore, be handled with greater care.

(iii) No hydrocarbon liquid fuel with flashpoint lower than that of No. 2 diesel fuel oil 125°F. minimum shall be used.

(iv) Crude oil and crankcase oil shall not be used.

(v) Metal powders such as aluminum shall be kept dry and shall be stored in containers or bins which are moisture-resistant or weathertight. Solid fuels shall be used in such manner as to minimize dust explosion hazards.

(vi) Peroxides and chlorates shall not be used.

(e) All electrical switches, controls, motors, and lights located in the mixing room shall conform to the requirements in chapter 296-24 WAC, Part L; otherwise they shall be located outside the mixing room. The frame of the mixer and all other equipment that may be used shall be electrically bonded and be provided with a continuous path to the ground.

(f) Safety precautions at mixing plants shall include the requirements of this subsection.

(i) Floors shall be constructed so as to eliminate floor drains and piping into which molten materials could flow and be confined in case of fire.

(ii) The floors and equipment of the mixing and packaging room shall be cleaned regularly and thoroughly to prevent accumulation of oxidizers or fuels and other sensitizers.

(iii) The entire mixing and packaging plant shall be cleaned regularly and thoroughly to prevent excessive accumulation of dust.

(iv) Smoking, matches, open flames, spark-producing devices, and firearms (except firearms carried by law enforcement bomb squad members or qualified guards) shall not be permitted inside of or within 50 feet of any building or facility used for the mixing of blasting agents.

(v) The land surrounding the mixing plant shall be kept clear of brush, dried grass, leaves, and other materials for a distance of at least 25 feet.

(vi) Empty ammonium nitrate bags shall be disposed of daily in a safe manner.

(vii) No welding shall be permitted or open flames used in or around the mixing or storage area of the plant unless the equipment or area has been completely washed down and all oxidizer material removed.

(viii) Before welding or repairs to hollow shafts, all oxidizer material shall be removed from the outside and inside of the shaft and the shaft vented with a minimum one-half inch diameter opening.

(ix) Explosives shall not be permitted inside of or within 50 feet of any building or facility used for the mixing of blasting agents.

(3) Bulk delivery and mixing vehicles.

(a) The provisions of this subsection shall apply to off-highway private operations as well as to all public highway movements.

(b) A bulk vehicle body for delivering and mixing blasting agents shall conform with the requirements of this subsection.

(i) The body shall be constructed of noncombustible materials.

(ii) Vehicles used to transport bulk premixed blasting agents on public highways shall have closed bodies.

(iii) All moving parts of the mixing system shall be designed as to prevent a heat buildup. Shafts or axles which contact the product shall have outboard bearings with 1-inch minimum clearance between the bearings and the outside of the product container. Particular attention shall be given to the clearances on all moving parts.

(iv) A bulk delivery vehicle shall be strong enough to carry the load without difficulty and be in good mechanical condition.

(c) Operation of bulk delivery vehicles shall conform to the requirements of WAC 296-52-489(2). These include the placarding requirements as specified by department of transportation.

(i) The operator shall be trained in the safe operation of the vehicle together with its mixing, conveying, and related equipment. The employer shall assure that the operator is familiar with the commodities being delivered and the general procedure for handling emergency situations.

(ii) The hauling of either blasting caps or other explosives but not both, shall be permitted on bulk trucks provided that a special wood or nonferrous-lined container is installed for the explosives. Such blasting caps or other explosives shall be in DOT-specified shipping containers: See 49 CFR Chapter I.

(iii) No person shall smoke, carry matches or any flame-producing device, or carry any firearms while in or about bulk vehicles effecting the mixing transfer or down-the-hole loading of blasting agents at or near the blasting site.

(iv) Caution shall be exercised in the movement of the vehicle in the blasting area to avoid driving the vehicle on to or dragging hoses over firing lines, cap wires, or explosive materials. The employer shall assure that the driver, in moving the vehicle, has assistance of a second person to guide the driver's movements.

(v) No intransit mixing of materials shall be performed.

(d) Pneumatic loading from bulk delivery vehicles into blastholes primed with electric blasting caps or other static-sensitive systems shall conform to the requirements of this subsection.

(i) A positive grounding device shall be used to prevent the accumulation of static electricity.

(ii) A discharge hose shall be used that has a resistance range that will prevent conducting stray currents, but that is conductive enough to bleed off static buildup.

(iii) A qualified person shall evaluate all systems to determine if they will adequately dissipate static under potential field conditions.

(e) Repairs to bulk delivery vehicles shall conform to the requirements of this section.

(i) No welding or open flames shall be used on or around any part of the delivery equipment unless it has been completely washed down and all oxidizer material removed.

(ii) Before welding or making repairs to hollow shafts, the shaft shall be thoroughly cleaned inside and out and vented with a minimum one-half-inch diameter opening.

(4) Bulk storage bins.

(a) The bin, including supports, shall be constructed of compatible materials, waterproof, and adequately supported and braced to withstand the combination of all loads including impact forces arising from product movement within the bin and accidental vehicle contact with the support legs.

(b) The bin discharge gate shall be designed to provide a closure tight enough to prevent leakage of the stored product. Provision shall also be made so that the gate can be locked.

(c) Bin loading manways or access hatches shall be hinged or otherwise attached to the bin and be designed to permit locking.

(d) Any electrically driven conveyors for loading or unloading bins shall conform to the requirements of chapter 296-24 WAC, Part L. They shall be designed to minimize damage from corrosion.

(e) Bins containing blasting agent shall be located, with respect to inhabited buildings, passenger railroads, and public highways, in accordance with Table H-20 and separation from other blasting agent storage and explosives storage shall be in conformity with Table H-22.

(f) Bins containing ammonium nitrate shall be separated from blasting agent storage and explosives storage in conformity with Table H-22.

(5) Transportation of packaged blasting agents.

(a) When blasting agents are transported in the same vehicle with explosives, all of the requirements of WAC 296-52-489 shall be complied with.

(b) Vehicles transporting blasting agents shall only be driven by and in charge of a driver at least twenty-one years of age who is capable, careful, reliable, and in possession of a valid motor vehicle operator's license. Such a person shall also be familiar with the states vehicle and traffic laws.

(c) No matches, firearms, acids, or other corrosive liquids shall be carried in the bed or body of any vehicle containing blasting agents.

(d) No person shall be permitted to ride upon, drive, load, or unload a vehicle containing blasting agents while smoking or under the influence of intoxicants, narcotics, or other dangerous drugs.

(e) It is prohibited for any person to transport or carry any blasting agents upon any public vehicle carrying passengers for hire.

(f) Vehicles transporting blasting agents shall be in safe operating condition at all times.

(g) When offering blasting agents for transportation on public highways the packaging, marking, and labeling of containers of blasting agents shall comply with the requirements of DOT.

(h) Vehicles used for transporting blasting agents on public highways shall be placarded in accordance with DOT regulations.

(6) Use of blasting agents. Persons using blasting agents shall comply with all of the applicable provisions of WAC 296-52-493.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-497, filed 3/6/95, effective 4/20/95; 91-03-044 (Order 90-18), § 296-52-497, filed 1/10/91, effective 2/12/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-497, filed 5/6/86.]

WAC 296-52-501 Water gel (slurry) explosives and blasting agents. (1) General provisions. Unless otherwise set forth in this section, water gels and emulsions shall be transported, stored and used in the same manner as explosives or blasting agents in accordance with the classification of the product.

(2) Types and classifications.

(a) Water gels and emulsion explosives containing a substance in itself classified as an explosive shall be classified as an explosive and manufactured, transported, stored, and used as specified for "explosives" in this section, except as noted in subsection (d) of this section.

(b) Water gels and emulsion explosives containing no substance in itself classified as an explosive and which are cap-sensitive as defined in WAC 296-52-417 under blasting agent shall be classified as an explosive and manufactured, transported, stored and used as specified for "explosives" in this section.

(c) Water gels and emulsion blasting agents containing no substance in itself classified as an explosive and which are not cap-sensitive as defined in WAC 296-52-417 under blasting agent shall be classified as blasting agents and manufactured, transported, stored, and used as specified for "blasting agents" in this section.

(d) When tests on specific formulations of water gels result in department of transportation classification as a Class B explosive, bullet-resistant magazines are not required, see WAC 296-52-453.

(3) Fixed location mixing.

(a)(i) Buildings or other facilities used for manufacturing emulsions and water gels shall be located with respect to inhabited buildings, passenger railroads and public highways, in accordance with Table H-21.

(ii) In determining the distances separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H-20), the sum of all masses that may propagate (i.e., lie at distances less than prescribed in Table H-22) from either individual or combined donor masses are included. However, when the ammonium nitrate must be included, only fifty percent of its weight shall be used because of its reduced blast effects.

(b) Buildings used for the manufacture of emulsions of water gels shall conform to the requirements of this subsection.

(i) Buildings shall be of noncombustible construction or sheet metal on wood studs.

(ii) Floors in a mixing plant shall be of concrete or of other nonabsorbent materials.

(iii) Where fuel oil is used all fuel oil storage facilities shall be separated from the manufacturing plant and located in such a manner that in case of tank rupture, the oil will drain away from the manufacturing plant building.

(iv) The building shall be well ventilated. Heating units that do not depend on combustion processes, when properly designed and located, may be used in the building. All direct sources of heat shall be provided exclusively from units located outside of the mixing building.

(v) All internal-combustion engines used for electric power generation shall be located outside the mixing plant building, or shall be properly ventilated and isolated by a fire-wall. The exhaust systems on all such engines shall be located so any spark emission cannot be a hazard to any materials in or adjacent to the plant.

(c) Ingredients of emulsion and water gels shall conform to the requirements of this subsection.

(i) Ingredients in themselves classified as Class A or Class B explosives shall be stored in conformity with WAC 296-52-461.

(ii) Nitrate-water solutions may be stored in tank cars, tank trucks, or fixed tanks without quantity or distance limitations. Spills or leaks which may contaminate combustible materials shall be cleaned up immediately.

(iii) Metal powders such as aluminum shall be kept dry and shall be stored in containers or bins which are moisture-resistant or weathertight. Solid fuels shall be used in such manner as to minimize dust explosion hazards.

(iv) Ingredients shall not be stored with incompatible materials.

(v) Peroxides and chlorates shall not be used.

(d) Mixing equipment shall comply with the requirements of this subsection.

(i) The design of the processing equipment, including mixing and conveying equipment, shall be compatible with the relative sensitivity of the materials being handled. Equipment shall be designed to minimize the possibility of frictional heating, compaction, overloading, and confinement.

(ii) Both equipment and handling procedures shall be designed to prevent the introduction of foreign objects or materials.

(iii) Mixers, pumps, valves, and related equipment shall be designed to permit regular and periodic flushing, cleaning, dismantling, and inspection.

(iv) All electrical equipment including wiring, switches, controls, motors, and lights, shall conform to the requirements of chapter 296-24 WAC, Part L.

(v) All electric motors and generators shall be provided with suitable overload protection devices. Electrical generators, motors, proportioning devices, and all other electrical enclosures shall be electrically bonded. The grounding conductor to all such electrical equipment shall be effectively bonded to the service-entrance ground connection and to all equipment ground connections in a manner so as to provide a continuous path to ground.

(e) Mixing facilities shall comply with the fire prevention requirements of this subsection.

(i) The mixing, loading, and ingredient transfer areas where residues or spilled materials may accumulate shall be cleaned periodically. A cleaning and collection system for dangerous residues shall be provided.

(ii) A daily visual inspection shall be made of the mixing, conveying, and electrical equipment to establish that such equipment is in good operating condition. A program of

systematic maintenance shall be conducted on regular schedule.

(iii) Heaters which are not dependent on the combustion process within the heating unit may be used within the confines of processing buildings, or compartments, if provided with temperature and safety controls and located away from combustible materials and the finished product.

(4) Bulk delivery and mixing vehicles.

(a) The design of vehicles shall comply with the requirements of this subsection.

(i) Vehicles used over public highways for the bulk transportation of emulsion and water gels or of ingredients classified as dangerous commodities, shall meet the requirements of the department of transportation and shall meet the requirements of WAC 296-52-489 and 296-52-497 of this section.

(ii) When electric power is supplied by a self-contained motor generator located on the vehicle the generator shall be at a point separate from where the water gel is discharged.

(iii) The design of processing equipment and general requirements shall conform to subsection (3)(c) and (d) of this section.

(iv) A positive action parking brake which will set the wheel brakes on at least one axle shall be provided on vehicles when equipped with air brakes and shall be used during bulk delivery operations. Wheel chocks shall supplement parking brakes whenever conditions may require.

(b) Operation of bulk delivery and mixing vehicles shall comply with the requirements of this subsection.

(i) The placarding requirements contained in DOT regulations apply to vehicles carrying water gel explosives or blasting agents.

(ii) The operator shall be trained in the safe operation of the vehicle together with its mixing, conveying, and related equipment. The operator shall be familiar with the commodities being delivered and the general procedure for handling emergency situations.

(iii) The hauling of either blasting caps or other explosives, but not both, shall be permitted on bulk trucks provided that a special wood or nonferrous-lined container is installed for the explosives. Such blasting caps or other explosives shall be in DOT-specified shipping containers; see 49 CFR Chapter I.

(iv) No person shall be allowed to smoke, carry matches or any flame-producing device, or carry any firearms while in or about bulk vehicles effecting the mixing, transfer, or down-the-hole loading of water gels at or near the blasting site.

(v) Caution shall be exercised in the movement of the vehicle in the blasting area to avoid driving the vehicle on to or dragging hoses over firing lines, cap wires, or explosive materials. The employer shall furnish the driver the assistance of a second person to guide the driver's movements.

(vi) No intransit mixing of materials shall be performed.

(vii) The location chosen for water gel or ingredient transfer from a support vehicle into the bore hole loading vehicle shall be away from the blasthole site when the bore holes are loaded or in the process of being loaded.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-501, filed 3/6/95, effective 4/20/95. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-501, filed 5/6/86.]

PART G—MISCELLANEOUS

WAC 296-52-505 Coal mining code unaffected. RCW 70.74.210 applies.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-505, filed 5/6/86.]

WAC 296-52-509 Small arms ammunition, primers, propellants and black powder. Storage, transportation, and display requirements.

(1) Scope. This section does not apply to in-process storage and intra-plant transportation during manufacture of small arms ammunition, small arms primers, and smokeless propellants.

(2) No quantity limitations are imposed on the storage of small arms ammunition in warehouses, retail stores, and other general occupancy facilities, except those imposed by limitations of storage facilities.

(3) Small arms ammunition shall be separated from flammable liquids, flammable solids as classified in 49 CFR, Part 172, and from oxidizing materials by a fire-resistant wall of one-hour rating or by a distance of 25 feet.

(4) Small arms ammunition shall not be stored together with class A or class B explosives unless the storage facility is adequate for this latter storage.

(5) Small arms smokeless propellants.

(a) Small arms smokeless propellant (class B) shall be packed, stored and transported in DOT approved shipping containers. The following shall apply.

	<u>Maximum Pounds Permitted</u>	<u>Special Restrictions</u>
Private residence or car _____	25 pounds or less _____ 25 to 50 pounds _____	None Store in strong box or cabinet constructed of 3/4-inch plywood (minimum) or equivalent, on all sides, top and bottom.
Dealer's warehouse _____	150 pounds _____	20 to 100 pounds shall be stored in portable or fixed wooden boxes having walls at least one inch nominal thickness.
Dealer's display _____	75 pounds _____	In one pound containers.

(b) Quantities in excess of 50 pounds shall be transported in accordance with federal department of transportation regulations. Quantities in excess of 150 pounds shall be stored in approved, licensed magazines as required in WAC 296-52-441 and 296-52-453.

(c) All smokeless propellants shall be stored in shipping containers specified in 49 CFR 173.93 for smokeless propellants.

(d) Commercial stocks of smokeless propellants over 20 pounds and not more than 100 pounds shall be stored in portable wooden boxes having walls of at least 1 inch nominal thickness.

(e) Commercial stocks in quantities not to exceed 150 pounds shall be stored in nonportable storage cabinets having wooden walls of at least 1 inch nominal thickness.

(f) Quantities in excess of 150 pounds shall be stored in magazines in accordance with WAC 296-52-461.

(6) Small arms ammunition primers.

(a) Small arms ammunition primers shall be packed, stored, and transported in DOT approved shipping containers. They shall be separate from flammable liquids, flammable solids, and oxidizing materials by a fire-resistant wall of one-hour rating or by a distance of 25 feet. The following shall also apply.

	<u>Maximum Number Permitted</u>	<u>Special Restrictions</u>
Private residence _____	10,000 primers	None
Private car _____	25,000 primers	None
Dealer's display _____	10,000 primers	None
Dealer's warehouse _____	750,000 primers	No more than 100,000 shall be stored in a pile and piles shall be separated by at least 15 feet.

(b) Quantities in excess of 750,000 primers shall be stored in approved, licensed magazines as required by WAC 296-52-441 and 296-52-453.

(7) Black powder, as used in muzzle loading firearms, shall be packed, stored and transported in DOT approved shipping containers and the following shall apply.

	<u>Maximum Pounds Permitted</u>	<u>Special Restrictions</u>
Private residence _____	5 pounds	None
Private car _____	5 pounds	None
Dealer's warehouse _____	25 pounds	None
Dealer's display _____	4 pounds	In one pound containers.

(8) Quantities in excess of 25 pounds of black powder, as used in muzzle loading firearms, shall be stored in approved, licensed magazines as required by WAC 296-52-441 and 296-52-453.

(9) Black powder manufactured for muzzle loading firearms shall not be used for blasting operations.

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-509, filed 3/6/95, effective 4/20/95; 90-03-029 (Order 89-20), § 296-52-509, filed 1/11/90, effective 2/26/90. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-10-044 (Order 86-24), § 296-52-509, filed 5/6/86.]

WAC 296-52-510 Explosives at piers, railway stations, and cars or vessels not otherwise specified in this

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standard. (1) Railway cars. Except in an emergency and with permission of the local authority, no person shall have or keep explosives in a railway car unless said car and contents and methods of loading are in accordance with the United States Department of Transportation Regulations for the Transportation of Explosives, 49 CFR Chapter I.

(2) Packing and marking. No person shall deliver any explosive to any carrier unless such explosive conforms in all respects, including marking and packing, to the United States Department of Transportation Regulations for the Transportation of Explosives.

(3) Marking cars. Every railway car containing explosives which has reached its designation, or is stopped in transit so as no longer to be in interstate commerce, shall have attached to both sides and ends of the car, cards with the words "explosives—handle carefully—keep fire away" in red letters at least 1 1/2 inches high on a white background.

(4) Storage. Any explosives at a railway facility, truck terminal, pier, wharf, harbor facility, or airport terminal whether for delivery to a consignee, or forwarded to some other destination shall be kept in a safe place, isolated as far as practicable and in such manner that they can be easily and quickly removed.

(5) Hours of transfer. Explosives shall not be delivered to or received from any railway station, truck terminal, pier, wharf, harbor facility, or airport terminal between the hours of sunset and sunrise.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-52-510, filed 1/11/90, effective 2/26/90.]

PART H—APPENDICES

WAC 296-52-550 Appendix I—IME two-compartment transportation units (mandatory). Storage of blasting caps (detonators) in the same magazine with other explosives is prohibited by WAC 296-52-457. The department of labor and industries (DLI) recognizes that it is often operationally desirable to transport both caps and other explosives in the same vehicle or trailer unit. Then, after the explosives laden vehicle arrives at the blast site, to utilize that vehicle and/or trailer unit as a mobile "day box" from which to dispense explosives into loading operations or into storage magazines.

The Institute of Makers of Explosives (IME) pamphlet No. 22, as revised in 1993, publishes construction criteria for two-compartment transportation units which are accepted by both the Bureau of Alcohol, Tobacco and Firearms (ATF) and U.S. Department of Transportation (DOT) for this purpose.

(1) Department of labor and industries will accept these "IME transportation units" as being approved for transporting both caps and explosives in the same vehicle or trailer, subject to the following:

(a) The dual-compartment units are constructed to the applicable IME specifications which are published in this Appendix I for the convenience of state users; and

(b) The units are correctly maintained and used in accordance with applicable federal regulations and this chapter (see in particular WAC 296-52-489); and

[Title 296 WAC—p. 1189]

(c) Only blasting caps which are classified by DOT as being nonmass-detonating are permitted to be transported in dual compartment units; and

(d) Detonators shall not be transported in the same compartment with other explosives or blasting agents; and

(e) Both the detonators and explosives, in separate appropriate compartments, shall be contained in the original DOT approved packages/containers; and

(f) The packages/containers shall be stacked or otherwise restrained from being easily displaced about the compartment during transit; and

(g) Even though constructed on the same motor vehicle or trailer frame, each compartment will be considered a separate container with individual construction and security requirements; and

(h) These IME transportation units are constructed to specifications which are greatly less bullet resistant and theft resistant than standard portable magazines. For that reason, these units cannot be utilized for unattended storage in this state; and

(i) On two compartment units, both compartments must be securely attached to the vehicle or trailer.

(2) Construction specifications.

(a) Each compartment must provide for total enclosure of the blasting caps or explosives.

(b) The partition between the explosives storage compartment and the blasting cap compartment must be of laminate construction consisting of A/C grade or better exterior plywood, gypsum board (sheetrock) and low carbon steel plates. In order of arrangement, the laminate must conform to the following, with minimum thickness of each lamination as indicated:

1/2 Inch plywood;

1/2 Inch gypsum board (sheetrock);

1/8 Inch low carbon steel; and

1/4 Inch plywood.

With the 1/4 inch plywood facing the explosives storage compartment.

See Appendix I-C for details of laminate construction. The door to the blasting cap compartment must be of metal construction or solid wood covered with metal. The outside walls and top must be of the same construction as the rest of the vehicle or trailer.

(c) As an alternative to the construction requirements shown in (b) of this subsection, a container for use only as illustrated in Appendix I-A may be used when constructed as follows:

(i) The top, lid or door, and the sides and bottom of each container must be of laminate construction consisting of A/C grade or better exterior plywood, solid hardwood, gypsum board (sheetrock), and sheet metal. In order of arrangement, the laminate must conform to the following, with minimum thickness of each lamination as indicated:

1/4 Inch plywood;

1 Inch solid hardwood;

1/2 Inch plywood;

1/2 Inch gypsum board (sheetrock)

(or 1/4 inch particle board); and

22 Gauge sheet metal.

Constructed inside to outside in that order. See Appendix I-D for detail of laminate construction.

(ii) The hardwood must be fastened together with wood screws, the 1/2 inch plywood must be fastened to the hardwood with wood screws, the inner 1/4 inch plywood must be fastened to the hardwood with adhesive, and the 22 gauge sheet metal must be attached to the exterior of the container with screws.

(d) The laminate composite material must be securely bound together by waterproof adhesive or other equally effective means.

(e) The steel plates at the joints of laminations must be secured by continuous fillet welds.

(f) All interior surfaces of the container or compartment must be constructed so as to prevent contact of contents with any sparking metal.

(g) There must be direct access into each compartment from outside the vehicle.

(h) Each container or compartment must have a snug fitting continuous piano-type hinged lid or door equipped with a locking device (or devices).

(i) Without permitting direct access to contents under normal conditions, the locking or hinging mechanisms must permit at least one edge of the lid or door to rise or move outward at least 1/2 inch when subjected to internal pressure.

(j) The exterior of the container or compartment must be weather-resistant.

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Safety Standards for the Possession and Handling of Explosives

APPENDIX I-A

PERMANENTLY MOUNTED CONTAINERS

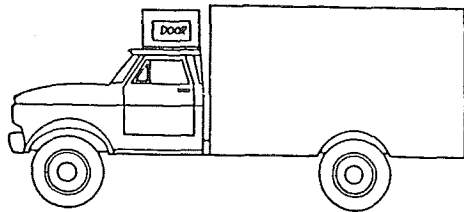


Figure 1

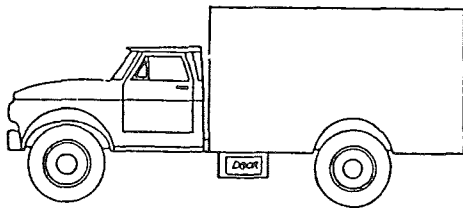


Figure 2

NOTE: The configurations shown in Figures 1 and 2 are equally applicable to multi-axle and "cab-over" vehicles.

[Diagrams: Courtesy of IME]

APPENDIX I-B

COMPARTMENTS

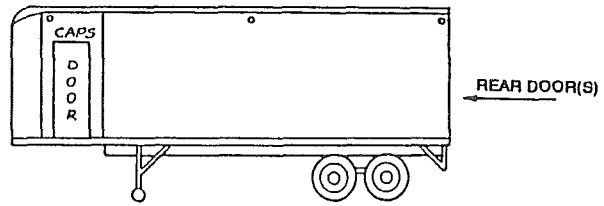


Figure 1

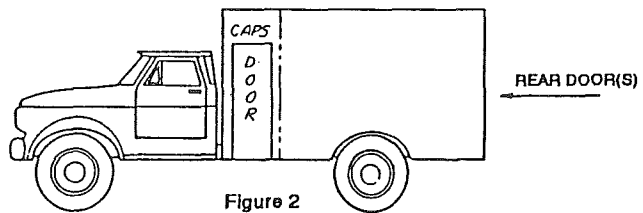


Figure 2

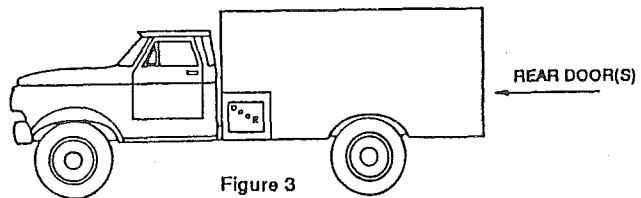


Figure 3

NOTE: The configurations shown in Figures 1 and 2 are equally applicable to multi-axle and "cab-over" vehicles.

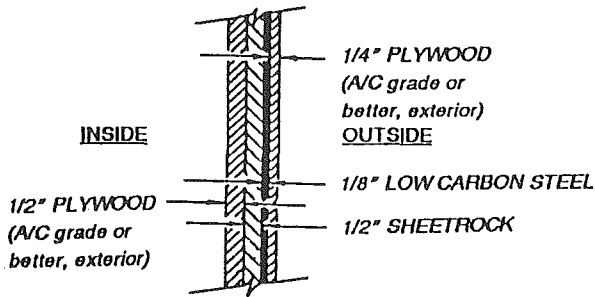
[Diagrams: Courtesy of IME]

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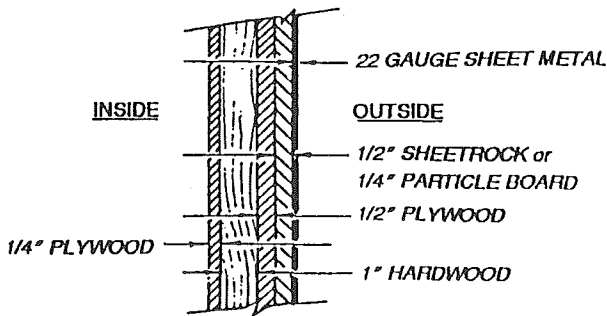
APPENDIX I-C

APPENDIX I-E



Sketch of laminate construction for container or compartment for electric blasting caps use, as illustrated in Appendix A, B, and E.

APPENDIX D



Sketch of laminate construction for container or compartment for electric blasting caps; restricted to use as illustrated in Appendix A.

[Diagrams: Courtesy of IME]

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-550, filed 3/6/95, effective 4/20/95.]

WAC 296-52-552 Appendix II—Radio frequency warning signs (mandatory). (1) This chapter requires that blasters using electric blasting caps shall post warning signs to prohibit the use of radio frequency transmitters within a clearance zone around all locations where the electric caps are being used. This appendix provides specific sign illustrations and posting instructions.

(a) In construction operations, including demolition, the clearance zone around electric caps shall be 1000 feet.

(b) In general industry operations not subject to construction requirements, the clearance zone around electric caps shall be 350 feet.

(c) On public highways, the Washington utilities and transportation commission and Washington department of transportation requires compliance with ANSI D6.1-1988, the *Uniform Traffic Control Devices* manual. On private roads under the jurisdiction of the department of labor and

[Title 296 WAC—p. 1192]

PORTABLE WHEELED TRAILERS

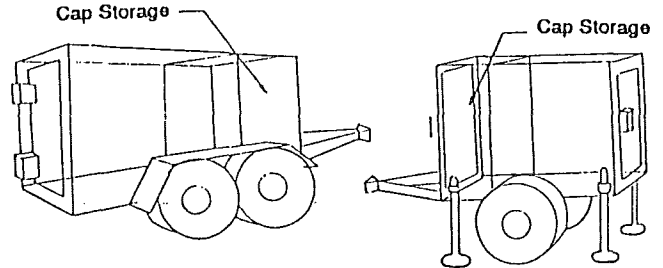


Figure 1

Figure 3

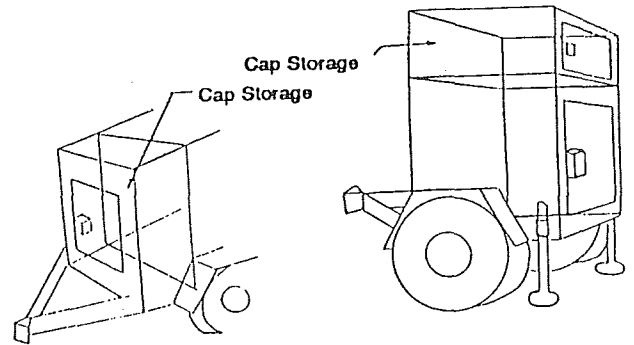


Figure 2

Figure 4

industries, strict compliance with ANSI is not required provided that: All roads or right of ways where RF transmitters would be carried are adequately posted to achieve the necessary notice; the signs are maintained in the necessary positions throughout the time when electric caps are present.

(2) Signs shall be reflectorized or illuminated to show the same shape, color and wording in both daylight or night when blasting is being done during hours of darkness.

(3) The signs shall be "CONSTRUCTION ORANGE" with black letters and borders, all upper case letters, not less than the sizes shown.

Note: Larger signs may be required where the highway speed limit is more than 55 M.P.H.

(4) Site survey.

(a) To comply with this section, the blaster in charge shall conduct, or cause to be conducted, an accurate survey of the entire intended blast site. The survey shall determine the clearance points where any road(s) or right-of-way(s) enter and exit the required clearance zone.

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(b) If the blast zone moves along as the job progresses, the 1000 foot clearance zone shall be adjusted to correctly maintain the permissible clearance borders at all times.

(5) The "TURN OFF 2-WAY RADIO" sign shall be posted at the beginning of the blast zone minimum clearance point.

(6) The "BLASTING ZONE 1000 FEET" sign shall be posted in sequence 1000 feet ahead of the "TURN OFF 2-WAY RADIO" sign.

In very slow vehicle travel zones such as off-road construction right-of-ways, rock pits or quarries, the separation distance between the signs may be reduced to as little as 300 feet.

(7) The "END BLASTING ZONE" sign shall be posted past the point where the blasting zone clearance limit ends.

(8) The warning signs required by the appendix shall be prominently displayed at all times when blasting operations are being conducted with an electric blasting cap initiation system. Blasting operations being conducted shall include any and all times when electric caps are present and have been removed from the original DOT approved shipping container.

(9) The blasting signs shall be covered or removed when blasting operations are not being conducted.

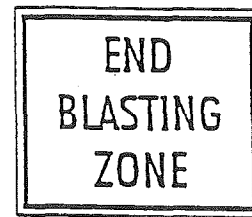
STANDARD WARNING SIGNS



W22-1
48" x 48"



W22-2
42" x 36"

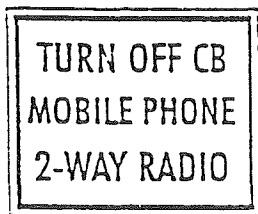


W22-3
42" x 36"

(10) New "TURN OFF 2-WAY RADIO" signs purchased after the effective date of this standard shall be modified to read "TURN OFF CB, MOBILE PHONE, 2-WAY RADIO."

(a) Modified signs may be used in place of the currently required sign immediately.

(b) Modified signs shall replace all currently required 2-way radio signs before January 1, 2000.



42" x 36"

[Statutory Authority: Chapter 49.17 RCW. 95-07-014, § 296-52-552, filed 3/6/95, effective 4/20/95.]

WAC 296-52-555 Appendix III—ATF regulations.
U.S. Department of Transportation Regulations as Excerpted from 49 CFR Part 173, 10/01/92 Edition.

Subpart C-Definitions, Classification, and Packaging for Class 1

Source: Amdt. 173-224, 55 FR 52617, Dec. 21, 1990, unless otherwise noted.

§ 173.50 Class 1-definitions. (a) Explosive. For the purpose of this subchapter, an *explosive* means any substance or article, including a device, which is designed to function by

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explosion (i.e., an extremely rapid release of gas and heat) or which, by chemical reaction within itself, is able to function in a similar manner even if not designed to function by explosion, unless the substance or article is otherwise classed under the provision of this subchapter.

(b) Explosives in Class 1 are divided into six divisions as follows:

(1) *Division 1.1* consists of explosives that have a mass explosion hazard. A mass explosion is one which affects almost the entire load instantaneously.

(2) *Division 1.2* consists of explosives that have a projection hazard but not a mass explosion hazard.

(3) *Division 1.3* consists of explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

(4) *Division 1.4* consists of explosives that present a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of this package.

(5) *Division 1.5*¹ consists of very insensitive explosives. This division is comprised of substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

(6) *Division 1.6*² consists of extremely insensitive articles which do not have a mass explosive hazard. This division is comprised of articles which contain extremely insen-

sitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

¹The probability of transition from burning to detonation is greater when large quantities are transported in a vessel.

²The risk from articles of *Division 1.6* is limited to the explosion of a single article.

§ Classification codes and compatibility groups of explosives.

(a) This classification code for an explosive, which is assigned by the Associate Administrator for Hazardous Materials Safety in accordance with this subpart, consists of the division number followed by the compatibility group let-

ter. Compatibility group letters are used to specify the controls for the transportation, and storage related thereto, of explosives and to prevent an increase in hazard that might result if certain explosives were stored together. Transportation compatibility requirements for carriers are prescribed in §§ 174.81, 175.78, 176.83 and 177.848 of this subchapter for transportation by rail, air, vessel, and public highway, respectively, and storage incidental thereto.

(b) Compatibility groups and classification codes for the various types of explosives are set forth in the following table. The table sets forth compatibility groups and classification codes for substances and articles described in the first column.

TABLE 1 - CLASSIFICATION CODES

Description of substances or article to be classified	Compatibility Group	Classification Code		
Primary explosive substance.	A	1.1A		
Article containing a primary explosive substance and not containing two or more effective protective features.	B	1.1B		
		1.2B		
		1.4B		
Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance.	C	1.1C		
		1.2C		
		1.3C		
		1.4C		
Secondary detonating explosive substance or black powder or article containing a secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features.	D	1.1D		
		1.2D		
		1.4D		
		1.5D		
Article containing a secondary detonating explosive substance, without means of initiation, with a propelling charge (other than one containing flammable liquid or hypergolic liquid).	E	1.1E		
		1.2E		
		1.4E		
		Article containing a secondary detonating explosive substance with its means of initiation, with a propelling charge (other than one containing flammable liquid or hypergolic liquid) or without a propelling charge.	F	1.1F
1.2F				
1.3F				
1.4F				
Article containing a secondary detonating explosive substance with its means of initiation, with a propelling charge (other than one containing flammable liquid or hypergolic liquid) or without a propelling charge.	G	1.1G		
		1.2G		
		1.3G		
		1.4G		
Pyrotechnic substance or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating incendiary, tear-producing or smoke-producing substance (other than a water-activated article or one containing white phosphorus, phosphide or flammable liquid or gel or hypergolic liquid).	H	1.2H		
		1.3H		
		Article containing both an explosive substance and white phosphorus.	J	1.1J
1.2J				
1.3J				
Pyrotechnic substance or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating incendiary, tear-producing or smoke-producing substance (other than a water-activated article or one containing white phosphorus, phosphide or flammable liquid or gel or hypergolic liquid).	K	1.2K		
		1.3K		
		Article containing both an explosive substance and white phosphorus.	L	1.1L
1.2L				
1.3L				
Article containing both an explosive substance and white phosphorus.	N	1.6N		
		Article containing both an explosive substance and flammable liquid or gel. Article containing both an explosive substance and a toxic chemical agent. Risk (e.g., due to water-activation or presence of hypergolic liquids, phosphide or pyrophoric substances) needing isolation of each type. Articles containing extremely insensitive detonating substances.	S	1.4S

§ 173.53 Provisions for using old classifications of explosives.

Where the classification system in effect prior to January 1, 1991, is referenced in State or local laws, ordinances or regulations not pertaining to the transportation of hazardous materials, the following table may be used to compare old and new hazard class names:

Current Classification

- Division 1.1
- Division 1.2
- Division 1.3
- Division 1.4
- Division 1.5
- Division 1.6

Class Name Prior to January 1, 1991

- Class A explosives
- Class A or Class B explosives
- Class B explosives
- Class C explosives
- Blasting agents
- No applicable hazard class

Part H, Appendicies
Chapter 296-52 WAC
Safety Standards for the Possession and Handling of Explosives

<p>Bureau of Alcohol, Tobacco and Firearms</p> <p>[Notice No. 695]</p> <p>COMMERCE IN EXPLOSIVES; LIST OF EXPLOSIVE MATERIALS</p> <p>Pursuant to the provisions of section 6-11(d) of Title 18, United States Code, and 27 CFR 63.23, the Director, Bureau of Alcohol, Tobacco and Firearms, must publish and revise at least annually in the Federal Register a list of explosives determined to be within the coverage of 18 U.S.C. Chapter 40, Importation, Manufacture, Distribution, and Storage of Explosive Materials. This Chapter covers not only explosives, but also blasting agents and detonators, all of which are defined as explosive materials in section 841(c) of Title 18, United States Code. Accordingly, the following is the 1989 List of Explosive Material subject to regulation under 18 U.S.C. Chapter 40, which includes both the list of explosives (including detonators) required to be published in the Federal Register and blasting agents. This list is intended to include any and all mixtures containing any of the materials in the list. Materials constituting blasting agents are marked by an asterisk. While the list is comprehensive, it is not all inclusive. The fact that an explosive material may not be on the list does not mean that it is not within the coverage of the law if it otherwise meets the statutory definitions in Section 841 of Title 18, United States Code. Explosive materials are listed alphabetically by their common names followed by chemical names and synonyms in brackets. This revised list supersedes the List of Explosive Materials dated December 28, 1988 (53 FR 52561) and will be effective as of January 12, 1990.</p> <p>List of Explosive Materials</p> <p>A</p> <p>Acetylides of heavy metals. Aluminum containing polymeric propellant. Aluminum ophomte explosive. Amatex. Ammonal. Ammonium nitrate explosive mixtures (cap sensitive), Ammonium nitrate explosive mixtures (non Ammonium perchlorate having particle size less than 15 microns.</p>	<p>Ammonium perchlorate composite propellant. Ammonium picrate (picrate of ammonia, Explosive D). ammonium salt lattice with isomorphously substituted inorganic salts. - ANFO (ammonium nitrate-fuel oil).</p> <p>B</p> <p>Baratol. Baronol. BEAF (1,2-bis (2-3-difluoro-2-nitroacatoxyethane)). Black powder. Black powder based explosive mixtures, - Blasting agents , nitro-carbo-nitrates, including non cap sensitive slurry and water-gel explosives Blasting caps. Blasting gelatin. Blasting powder. BTNEC (bis (trinitroethyl) carbonate). BTNEN (bis (trinitroethyl(nitramine)). BTTN (1,2,4 butanetriol trinitrate). Butyl tetryl.</p> <p>C</p> <p>Calcium nitrate explosive mixture. Cellulose hexanitrate explosive mixture. Chlorate explosive mixtures. Composition A and variations. Composition B and variations. Composition C and variations. Copper acetylde. Cyanuric triaxide. Cyclotrimathylenetrinitramine (RDX). Cyclotetramethylenetetranitramine (HMX). Cyclonite (RDX). Cyclotol.</p> <p>D</p> <p>DATB (diaminotrinitrobenzene). DDNP (diazodinitrophenol). DEGND (diethyleneglycol dinitrate). Detonating cord. Detonators. Dimethylol dimethyl methane dinitrate composition. Dinitroethylensures. Dinitroglycerine (glycerol dinitrate). Dinitrophenol. Dinitrophenolates. Dinitrotolnene-sodium nitrate explosive mixtures. DIPAM</p>	<p>Dipicryl sulfone. Dipicrylamina DNNDP (dinitropentano nitrile).</p> <p>E</p> <p>EDDN (ethylene diamine dinitrate) EDNA Ednatol EDNP (ethyl 4,4-ddipitropentanoate) Erythritol tetranitrate explosives Eslers of nitro-substituted alcohols EGDN (ethylene glycol dinitrate) Ethyl-tetryl Explosive conitrates Explosive gelatins Explosive mixtures containing oxygen releasing inorganic salts and hydrocarbons Explosive mixtures containing oxygen releasing inorganic salts and nitro bodies Explosive mixtures containing oxygen releasing inorganic salts and water soluble fuels Explosive mixtures containing sensitized nitromethane Explosive mixtures containing tetraintromethane (nitroform) Explosive nitro compounds of aromatic hydrocarbons Explosive organic nitrate mixtures Explosive liquids Explosive powders</p> <p>F</p> <p>Flash powder Fulminate of mercury Fulminate of silver Fulminating gold Fulminating mercury Fulminating platinum Fulminating silver</p> <p>G</p> <p>Gelatinized nitrocellulose Gem-dinitro aliphatic explosive mixtures Guanyl nitrosamino tetrazene Guanyl nitrosamino guanylidene hydrazine</p> <p>H</p> <p>Heavy metal azides Hexanite Hexanitrodiphenylamine Hexanitrostilbene Hexogen [RDX]</p>
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Hexogene or octogene and a nitrated N-methylaniline	N	Picratol
Hexolites	NIBTN [nitroisobutametrial trinitrate]	Picric acid (manufactured as an explosive)
HMX [cyclo-1,3,5,7-tetamethylene-2,4,6,8-tetranitramine; Octogen]	Nitrate sensitized with gelled nitropraffin	Picryl chloride
Hydrazinium nitrate/hydrazine/aluminum explosive system	Nitrated carbohydrate explosives	Picryl fluoride
Hydrazoic acid	Nitrated glucoside explosive	PLX [95% nitromethane, 5% ethylenediamine]
I	Nitrated polyhydric alcohol explosives	Polynitro aliphatic compounds
Igniter cord	Nitrates of soda explosive mixtures	Polyolpolynitrate-nitrocellulose explosive gels
Igniters	Nitric acid and a nitro aromatic compound explosive	Potassium chlorate and lead sulfocyanate explosive
Initiating tube systems	Nitro compounds of furane explosive mixtures	Potassium nitrate explosive mixtures
K	Nitrocellulose explosive	Potassium Nitroaminotetrazole
KDNBF [potassium dinitrobenzo-furoxane]	Nitroderivative of urea explosive mixture	R
L	Nitrogelatin explosive	RDX [cyclonite, hexogen, T4, cyclo-1,3,5,-trimethylene-2,4,6,-trinitramine; hexahydro-1,3,5-trinitro-S-triazine]
Lead azide	Nitrogen trichloride	S
Lead mannite	Nitrogen tri-iodide	Safety fuse
Lead mononitroresorcinate	Nitroglycerine [NG, RNG, nitro, glyceryl trinitrate, trinitroglycerine]	Salutes, (bulk)
Lead picrate	Nitroglycide	Salts of organic ammino sulfonic acid explosive mixtures
Lead salts, explosive	Nitroglycol (ethylene glycol dinitrate, EGDN)	Silver acetyline
Lead styphnate [styphnate of lead, lead trinitroresorcinate]	Nitroguanidine explosives	Silver azide
Liquid nitrated polyol and trimethylolethane	Nitroparaffins Explosive Grade and ammonium nitrate mixtures	Silver fulminate
Liquid oxygen explosives	Nitronium perchlorate propellant mixtures	Silver oxalate explosive mixtures
M	Nitrostrach	Silver styphnate
Magnesium ophorite explosives	Nitro-substituted carboxylic acids	Silver tartrate explosive mixtures
Mannitol hexanitrate	Nitrourea	Silver tetrazene
MDNP [methyl 4,4-dinitropentanoate]MEAN [monoethanolamine nitrate]	O	Slurried explosive mixtures of water, inorganic oxidizing salts, gelling agent, fuel and sensitizer (cap sensitive)
Mercuric fulminate	Octogen [HMX]	Smokeless powder
Mercury oxalate	Octol [75% HMX, 25% TNT]	Sodatol
Nitric acid and carboxylic fuel explosive	Organic amine nitrates	Sodium amatol
Nitric acid explosive mixtures	Organic nitramines	Sodium azide explosive mixture
Nitro aromatic explosive mixtures	P	Sodium dinitro-ortho-cresolate
Mercury tartrate	PBX [RDX and plasticizer]	Sodium nitrate-potassium nitrate explosive mixture
Metrial trinitrate	Pellet Powder	Sodium picramate
Minol-2 [40% TNT, 40% ammonium nitrate, 20% aluminum]	Penthrinite composition	Special fireworks
MMAN [monomethylamine nitrate]; methylamine nitrate	Pentolite	Squibs
Mononitrotoluene-nitroglycerin mixture	PYX [2,6-bis(picrylamino)-3,5-dinitropyridine]	Stypnic acid explosives
Monopropellants	Perchlorate explosive mixtures	T
	Peroxide based explosive mixtures	Tacot [tetranitro-2,3,5,6-dibenzo-1,3a, 4,6a-tetrazapentalene]
	PETN [nitropentaerythrite, pentaerythrite tetranitrate, pentaerythritol tetranitrate]	TATB [triaminotrinitrobenzene]
	Picramic acid and its salts	
	Picramide	
	Picrate of potassium explosive mixtures	

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TEGDN [triethylene glycol dinitrate]	Water-in-oil emulsion explosive compositions	
Tetrazene [tetracene, tetrazine, 1(5-tetrazol)-4-guanyl tetrazene hydrate]		
Tetranitrocarbazole	X	
Tetryl [2, 4, 6 tetranitro-N-methylaniline]		
Tetrytol	Xanthomonas hydrophilic colloid explosive mixture	
Thickened inorganic oxidizer salt slurried explosive mixture		
TMETN (trimethylolethane trinitrate)	FOR FURTHER INFORMATION CONTACT:	
TNEF [trinitroethyl formal]	Linda Deel, Specialist, Firearms and Explosives Operations Branch, Bureau of Alcohol, Tobacco and Firearms, 650 Massachusetts Avenue, NW., Washington DC 20226 (202) 927-8310	
TNEOC [trinitroethyl orthoformate]		
TNEOF [trinitroethyl orthoformate]		
TNT [trinitrotoluene, trotyl, trilitite, triton]		
Tropex		
Tridite	Approved: January 2, 1992.	
Trimethylol ethyl methane trinitrate composition		
Trimethylolthase trinitrate-nitrocellulose		
Trimonite		
Trinitroanisole		
Trinitrobenzene		
Trinitrobenzoic acid		
Trinitrocresol		
Trinitro-meta-cresol		
trinitronaphthalene		
Trinitrophenetol		
Trinitrochloroglucinol		
Trinitroresorcinol		
Tritonal		
U		
Urea nitrate		
W		
Water bearing explosives having salts of oxidizing acids and nitrogen bases, sulfates, or sulfamates (cap sensitive)		

[Statutory Authority: Chapter 49.17 RCW, 95-07-014, § 296-52-555, filed 3/6/95, effective 4/20/95.]

Chapter 296-54 WAC

SAFETY STANDARDS—LOGGING OPERATIONS

WAC

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296-54-57345	Logging machines—Moving.		
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296-54-577	Yarding, skidding, landing.	296-54-030	Management's responsibility. [Order 72-14, § 296-54-030, filed 7/31/72, effective 9/1/72; Rules, § I, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-579	Log decks.		
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296-54-583	Loading logs.	296-54-040	Employee's responsibility. [Order 72-14, § 296-54-040, filed 7/31/72, effective 9/1/72; Rules, § II, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-584	Tongs, hooks, grapples.		
296-54-585	Cross-haul systems.		
296-54-587	Self-loading log trucks.		
296-54-589	Log trucks—General.		
296-54-58910	Log trucks—Brakes.		
296-54-58920	Log trucks—Trailer hitches and safety chains.	296-54-050	through 296-54-125. Safety and first aid. [Rules (part), filed 7/6/61, 3/23/60.] Decodified. See chapter 296-25 WAC, General safety standards.
296-54-58930	Log trucks—Reaches and bunks.		
296-54-58940	Log trucks—Stakes, stake extensions and chock blocks.		
296-54-58950	Log trucks—Wrappers and binders.	296-54-051	Safety educational and first aid requirements. [Order 72-14, § 296-54-051, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-58960	Log trucks—Miscellaneous requirements.		
296-54-58970	Log trucks—Steered trailers.		
296-54-591	Stationary log truck trailer loading.		
296-54-593	Log unloading, booms, and rafting grounds—Storage and sorting areas—General.	296-54-052	General requirements. [Order 72-14, § 296-54-052, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-59310	Log unloading, booms, and rafting grounds—Water dumps.		
296-54-59320	Log unloading, booms, and rafting ground—Boom and rafting grounds.		
296-54-59330	Log unloading, booms, and rafting grounds—Boats and mechanical devices on waters.	296-54-130	Camps. [Order 72-14, § 296-54-130, filed 7/3/72, effective 9/1/72; Rules, § IV, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-59340	Log unloading, booms, and rafting grounds—Dry land sorting and storage.		
296-54-595	Transporting crews.		
296-54-59510	Speeders used to transport crews.		
296-54-59520	Trailers used to transport crews.	296-54-140	Railroad and truck road construction and maintenance—Railroads. [Order 72-14, § 296-54-140, filed 7/31/72, effective 9/1/72; Rules, § V (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-597	Railroads.		
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296-54-59720	Railroad operations.		
296-54-59730	Railroad maintenance—Loading or unloading.		
296-54-601	Signals and signal systems.		
296-54-603	Electric signal systems.		
296-54-604	Radio signaling permits.	296-54-150	Truck roads. [Order 72-14, § 296-54-150, filed 7/31/72, effective 9/1/72; Rules, § V (part), filed 6/2/67, 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-605	Radio systems used for voice communication, activation of audible signals, or control of equipment.		
296-54-607	Radio signal systems—Specifications and test procedures.		
296-54-701	Wood spar trees.		
296-54-70110	Wood spar trees—Guylines.	296-54-160	Transportation of crews—General requirements. [Order 72-14, § 296-54-160, filed 7/31/72, effective 9/1/72; Rules, § VI (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-70120	Wood spar trees—Passlines.		
296-54-70130	Wood spar trees—Straps.		
296-54-705	Truck and equipment maintenance shops.		
296-54-707	Labor camps.		
296-54-99002	Appendix 1—Signals.		
296-54-99003	Appendix 2—Sample minimum lockout/tagout procedure.	296-54-170	Transportation of crews by use of speeders and trailers. [Order 72-14, § 296-54-170, filed 7/31/72, effective 9/1/72; Rules, § VI (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61, 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-99004	Appendix 3—Industry consensus standards.		
296-54-99013	Appendix 4—Various types of cable logging systems.		
296-54-99014	Appendix 5—Wooden tree yarding and loading systems.	296-54-180	Transportation of crews by motor vehicles. [Order 72-14, § 296-54-180, filed 7/31/72, effective 9/1/72; Rules, § VI (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER			
296-54-001	Scope and application. [Order 72-14, § 296-54-001, filed 7/31/72, effective 9/1/72; Rules (part), filed 6/2/67, effective 7/10/67.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.	296-54-185	Methods of crew transportation other than those specified. [Order 72-14, § 296-54-185, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
296-54-003	Waiver and variance. [Order 72-14, § 296-54-003, filed 7/31/72, effective 9/1/72; Rules (part), filed 6/2/67, effective 7/10/67.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.	296-54-190	Rigging. [Order 72-14, § 296-54-190, filed 7/31/72, effective 9/1/72; Rules, § VIII, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60; Addendum, filed 3/30/62.] Repealed by 79-10-
296-54-010	Definitions of terms used in the logging standards for the purpose of this chapter. [Order 76-29, § 296-54-010,		

- 081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-195 Additional requirements for portable spars and boom type yarding and loading machines. [Order 72-14, § 296-54-195, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-200 Yarding. [Order 72-14, § 296-54-200, filed 7/31/72, effective 9/1/72; Rules, § XII, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-202 Yarding—Signal transmission, signaling equipment and related items. [Rules AB-2 through AB-11, effective 1/2/65; Rules L-4, L-5, L-6, L-16, L-22 through L-27, filed 7/6/61; Rules (part), filed 3/23/60.] Superseded by Rules, filed 6/27/67, effective 7/10/67. See WAC 296-54-350 through 296-54-393.
- 296-54-210 Tractor logging. [Order 72-14, § 296-54-210, filed 7/31/72, effective 9/1/72; Rules, § XIII, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-215 Canopy guards, barricades, seat belts, screens and other items required for industrial equipment. [Order 72-14, § 296-54-215, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-216 Roll-over protective structures and overhead protection. [Order 72-14, § 296-54-216, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-217 Braking systems for tractors and other mobile equipment. [Order 72-14, § 296-54-217, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-218 Emergency steering. [Order 72-14, § 296-54-218, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-220 Log loading. [Order 72-14, § 296-54-220, filed 7/31/72, effective 9/1/72; Rules, § XIV, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-230 Lines, blocks and shackles. [Order 72-14, § 296-54-230, filed 7/31/72, effective 9/1/72; Rules, § IX, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-240 Yarding, loading, and skidding units. [Order 72-14, § 296-54-240, filed 7/31/72, effective 9/1/72; Rules, § X, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-250 New and used boiler or pressure vessels. [Rules (part), filed 7/6/61, 3/23/60.] Superseded by Rules, filed 6/27/67, effective 7/10/67. See WAC 296-54-240(9) and chapter 70.79 RCW.
- 296-54-260 Falling—Bucking. [Order 72-14, § 296-54-260, filed 7/31/72, effective 9/1/72; Rules, § VII, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-270 Moving machines. [Order 72-14, § 296-54-270, filed 7/31/72, effective 9/1/72; Rules, § XI, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-280 General requirements. [Order 76-29, § 296-54-280, filed 9/30/76; Order 72-14, § 296-54-280, filed 7/31/72, effective 9/1/72; Rules, § XIX, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-281 Water dumps. [Order 72-14, § 296-54-281, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-282 Boom and rafting grounds. [Order 76-7, § 296-54-282, filed 3/1/76; Order 72-14, § 296-54-282, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-284 Dry land sorting and storage. [Order 72-14, § 296-54-284, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-286 Boats and mechanical devices on water. [Order 76-7, § 296-54-286, filed 3/1/76; Order 72-14, § 296-54-286, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-290 Electrical logging equipment. [Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-300 Explosives. [Order 72-14, § 296-54-300, filed 7/31/72, effective 9/1/72; Rules, § XX, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-310 Railroad operations. [Order 72-14, § 296-54-310, filed 7/31/72, effective 9/1/72; Rules, § XVI, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-320 Railroad maintenance, loading or unloading. [Order 72-14, § 296-54-320, filed 7/31/72, effective 9/1/72; Rules, § XVII, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-330 Motor truck log transportation. [Order 72-14, § 296-54-330, filed 7/31/72, effective 9/1/72; Rules, § XV, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-335 Stationary log truck trailer loading. [Order 72-14, § 296-54-335, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-340 Maintenance shops. [Order 72-14, § 296-54-340, filed 7/31/72, effective 9/1/72; Rules, § XVIII, filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-350 Signals and signal systems. [Order 72-14, § 296-54-350, filed 7/31/72, effective 9/1/72; Rules, § XXI (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-360 Skidder whistle signals. [Order 72-14, § 296-54-360, filed 7/31/72, effective 9/1/72; Rules, § XXI (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-370 Slackline whistle signals. [Order 72-14, § 296-54-370, filed 7/31/72, effective 9/1/72; Rules, § XXI (part), filed 6/2/67, effective 7/10/67; Rules (part), filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-380 High lead logging whistle signals. [Order 72-14, § 296-54-380, filed 7/31/72, effective 9/1/72; Rules, § XXI (part), filed 6/2/67, effective 7/10/67; Rules AB-1, effective 1/2/65; Rule Z-3, filed 7/6/61; Rules (part), filed 3/23/60.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.

- 296-54-390 High lead whistle signal—General whistle signals. [Rules (part), filed 7/6/61, 3/23/60.] Superseded by Rules, filed 6/27/67, effective 7/10/67. For later enactment see WAC 296-54-391 through 296-54-393.
- 296-54-391 General requirements for signaling and signal equipment. [Rules, § XXI (part), filed 6/2/67, effective 7/10/67.] Repealed by omission, Order 72-14, filed 7/31/72.
- 296-54-392 Electric signal systems. [Order 72-14, § 296-54-392, filed 7/31/72, effective 9/1/72; Rules, § XXI (part), filed 6/2/67, effective 7/10/67.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-393 Radio systems used for voice communications, activation of audible signals or equipment. [Order 72-14, § 296-54-393, filed 7/31/72, effective 9/1/72; Rules, § XXI (part), filed 6/2/67, effective 7/10/67.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-39301 Form No. 157—Application for permit to operate radio signal system in designated area. [Order 72-14, Form No. 157 (codified as WAC 296-54-39301), filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-399 Special rigging standards. [Rules (part), filed 7/6/61, 3/23/60. Recodified from WAC 296-54-400 to avoid duplication of numbering.] Superseded by Rules, filed 6/27/67, effective 7/10/67. See WAC 296-54-190.
- 296-54-400 Radio-signaling systems—Minimum requirements. [Order 72-14, § 296-54-400, filed 7/31/72, effective 9/1/72.] Repealed by 79-10-081 (Order 79-14), filed 9/21/79. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240.
- 296-54-450 Rules and regulations of the state board of health concerning labor camps. [Rules (part), filed 7/6/61, 3/23/60.] Decodified. See WAC 296-54-130, and chapters 296-26 and 248-60 WAC.
- 296-54-45001 Pulpwood logging. [Statutory Authority: Chapter 49.17 RCW, 88-23-054 (Order 88-25), § 296-54-45001, filed 11/14/88; Order 76-7, § 296-54-45001, filed 3/1/76; Order 74-20, § 296-54-450 (codified as WAC 296-54-45001), filed 5/6/74.] Repealed by 96-22-013, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060.
- 296-54-525 Railroad construction and maintenance. [Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-525, filed 9/21/79.] Repealed by 99-17-117, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050.
- 296-54-559 Yarding—Helicopters and helicopter cranes. [Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-559, filed 10/28/96, effective 1/1/97. Statutory Authority: Chapter 49.17 RCW, 88-23-054 (Order 88-25), § 296-54-559, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 81-05-013 (Order 81-3), § 296-54-559, filed 2/10/81. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-559, filed 9/21/79.] Amended and decodified by 99-17-117, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-54-599 Truck and equipment maintenance shops. [Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-599, filed 9/21/79.] Repealed by 99-17-117, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-54-990 Map. [Order 72-14, Map (codified as WAC 296-54-990), filed 7/31/72, effective 9/1/72.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- 296-54-99001 Appendix I—Figure 1—Rigging up, wrapping a guyline. [Order 72-14, Figure 1 (codified as WAC 296-54-99001), filed 7/31/72, effective 9/1/72.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- 296-54-99005 Appendix I—Figure 5—Standard signals for tractor logging. [Order 72-14, Figure 5 (codified as WAC 296-54-99005), filed 7/31/72, effective 9/1/72.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- 296-54-99006 Appendix I—Figure 6—Standard signals for loading logs. [Order 72-14, Figure 6 (codified as WAC 296-54-99006), filed 7/31/72, effective 9/1/72.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- 296-54-99007 Appendix I—Figure 7—Heel boom loading. [Order 72-14, Figure 7 (codified as WAC 296-54-99007), filed 7/31/72, effective 9/1/72.] Repealed by 99-22-045, filed 10/29/99, effective 12/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-54-99008 Appendix I—Figure 8—Guyline loading. [Order 72-14, Figure 8 (codified as WAC 296-54-99008), filed 7/31/72, effective 9/1/72.] Repealed by 99-22-045, filed 10/29/99, effective 12/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-54-99009 Appendix I—Figure 9—Hayrack boom loading. [Order 72-14, Figure 9 (codified as WAC 296-54-99009), filed 7/31/72, effective 9/1/72.] Repealed by 99-22-045, filed 10/29/99, effective 12/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-54-99010 Appendix I—Figure 10—Spreader bar loading. [Order 72-14, Figure 10 (codified as WAC 296-54-99010), filed 7/31/72, effective 9/1/72.] Repealed by 99-22-045, filed 10/29/99, effective 12/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-54-99011 Appendix I—Figure 11—Placement and number of binders. [Order 72-14, Figure 11 (codified as WAC 296-54-99011), filed 7/31/72, effective 9/1/72.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- 296-54-99012 Appendix I—Figure 12—Standard signals for high lead logging. [Order 72-14, Figure 12 (codified as WAC 296-54-99012), filed 7/31/72, effective 9/1/72.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.

WAC 296-54-501 Scope and application. This chapter establishes safety practices for all types of logging, log road construction and other forest activities using logging machinery and/or power saws regardless of the end use of the wood. This chapter does not apply to log handling at sawmills, plywood mills, pulp mills, or other manufacturing operations governed by specific safety standards. This chapter provides minimum safety requirements for the logging industry. The logging industry is also covered by the general safety standards, chapter 296-24 WAC; occupational health standards, chapter 296-62 WAC; or others that may apply. Chapter 296-52 WAC, which covers the possession, handling and use of explosives, applies when explosives are used in logging operations.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-501, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-501, filed 10/28/96, effective 1/1/97. Statutory Authority: Chapter 49.17 RCW, 88-23-054 (Order 88-25), § 296-54-501, filed 11/14/88. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-501, filed 9/21/79.]

WAC 296-54-503 Variance. If an employer finds it impractical to comply with specific requirements of this chapter, the department may permit a variation from the requirements. However, the employer must still provide equal protection by substitute means. To request a variance, write to:

WISHA Services Division—Variance Request
Department of Labor & Industries
P.O. Box 44648
Olympia, WA 98504-4648

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-503, filed 8/18/99, effective 12/1/99. Statutory Authority:

RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-503, filed 9/21/79.]

WAC 296-54-505 Definitions. A-frame - a structure made of two independent columns fastened together at the top and separated by a reasonable width at the bottom to stabilize the unit from tipping sideways.

An operation - any place where logging or log related activities are taking place.

Approved - approved by the department of labor and industries.

Arch - any device attached to the back of a vehicle and used for raising one end of logs to facilitate movement.

Authorized person - a person approved or assigned by the employer to perform a specific type of duty(s) or to be at a specific location at a certain time(s).

Backcut (felling cut) - the cut in a felling operation made on the opposite side from the undercut.

Backline - the portion of the haulback that runs between the spar/spar tree and the corner block.

Ballistic nylon - a nylon fabric of high tensile properties designed to provide protection from lacerations.

Barrier - a fence, wall or railing to prevent passage or approach.

Base of tree - that portion of a natural tree not more than three feet above ground level.

Bight of the line - a hazardous zone created by running lines under tension. Any section of a line between the ends.

Binder - a hinged lever assembly for connecting the ends of a wrapper to tighten the wrapper around the load of logs or materials.

Boomboat - any boat used to push or pull logs, booms, bundles, or bags, in booming ground operations.

Boomscooter - a small boat, usually less than fourteen feet in length, equipped with an outboard motor, having directional pushing capabilities of 360 degrees.

Brailing - when tiers of logs, poles, or piles are fastened together with a type of dogline and the ends of the side members are then fastened together for towing.

Brow log - a log or a suitable substitute placed parallel to any roadway at a landing or dump to protect the carrier and facilitate the safe loading or unloading of logs, timber products, or materials.

Buck - means the process of severing a tree into sections (logs or bolts).

Butt - the bottom of the felled part of a tree.

Butt welding - the practice of welding something end to end.

Cable tree thinning - the selective thinning of a timber stand using mobile yarding equipment specifically designed or adapted for the purpose. Cable tree thinning includes skyline, slackline, or modified slackline, overhead cable systems.

Cable yarding - the movement of felled trees or logs from the area where they are felled to the landing on a system composed of a cable suspended from spars and/or towers. The trees or logs may be either dragged across the ground on the cable or carried while suspended from the cable.

Chock - a block, often wedge shaped, which is used to prevent movement; e.g., a log from rolling, a wheel from turning.

Choker - a length of wire rope with attachments for encircling the end of a log to be yarded.

Chunking - to clear nonusable material from a specified area.

Cold deck - a pile of yarded logs left for future removal.

Competent person - one who is capable of identifying hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous.

Corner block - the first block the haulback passes through on its way to the tail block.

Crotch line - two short lines attached to the same ring or shackle, used for loading or unloading.

Cutter - an employee whose primary job is to fall, buck, or limb trees before they are moved to the landing area.

Danger trees - any tree of any height, dead or alive, that presents a hazard to workers because of rot, root, stem or limb damage, lean, or any other observable condition created by natural process or man-made activity.

Dapped - a notch in a timber for receiving part of another timber.

DBH - diameter at breast height.

Deadman - buried log or other object used as an anchor.

Debark - to remove bark from trees or logs. Debark generally denotes mechanical means as opposed to manual peeling.

Deck - a stack of trees or logs.

Designated person - an employee who has the requisite knowledge, training, and experience to perform specific duties.

Directional falling - a mechanical means to control the direction of falling timber.

Dog line - type of line used to fasten logs or timber products together by the use of dogs.

Domino felling - the partial cutting of multiple trees which are left standing and then pushed over with a pusher tree.

Donkey - any machine with a series of drums used to yard logs.

Double ended logs - two logs end to end on the same lay.

Drop zone - the area where the helicopter delivers logs from the logging site.

Droplines - a short line attached to the carriage or carriage block which is used as an extension to the main line.

Drum - a mechanical device on which line is spooled or unspooled.

Dry land storage - decks of logs stored for future removal or use.

Dutchman -

- A block used to change direction of line lead (side-blocking).

- A method used to pull a tree against its lean by leaving a section of the undercut on one corner of the face. The portion left consists of a single saw kerf in one side of the face, with the face completely removed on the opposite side of the face cut. A single saw kerf must never extend completely across the stump.

Experienced person - a person who has been trained and has participated in the subject process for a period of time long enough to thoroughly acquaint the person with all facets of the process.

F.O.P.S. - falling object protective structure.

Fair lead - sheaves, rolls, or a combination thereof arranged to receive a line coming from any direction for proper line spooling on to a drum.

Fell (fall) - to cut down trees.

Feller (faller) - an employee who fells trees.

Front end loader - a mobile machine mounted on a wheeled or tracked chassis, equipped with a grapple, tusk, bucket, or fork-lift device, and employed in the loading, unloading, stacking, or sorting of logs or materials.

Grounded - the placement of a component of a machine on the ground or on a device where it is firmly supported. Grounded may also relate to the placement of a tree on the ground or a method to dissipate static or electrical charges.

Guarded - covered, shielded, fenced, enclosed, or otherwise protected by means of suitable enclosures, covers, casings, shields, troughs, railings, screens, mats, or platforms, or by location, to prevent injury.

Guard rail - a railing to restrain a person.

Guyline - a line used to support or stabilize a spar, tail/lift tree, intermediate support tree or equipment. A guyline is considered a standing line.

Gypsy drum - a mechanical device wherein the line is not attached to the drum and is manually spooled to control the line movement on and off the drum.

Haulback - a line used to pull the buttrigging and mainline to the logs to be yarded.

Haulback block - any block the haulback line passes through including the corner block and tailblock.

Hay rack -

- A type of loading boom where two tongs are used and logs are suspended.

- A transporting vehicle with multiple sets of bunks attached to a rigid frame usually used for hauling logs.

Haywire - see strawline.

Hazardous falling area - the area within a circle centered on the tree being felled and having a radius not less than twice the height of that tree.

Head tree - the tree where yarding and/or loading takes place. (See spar)

Heel boom - a type of loading boom where one tong is used and one end of the log is pulled up against the boom.

High lead - a system of logging wherein the main line is threaded through the main line block, which is attached near the top of the spar, to obtain a lift of the logs being yarded.

High visibility colors - white, bright, or fluorescent colors that stand out from the surrounding background color so they are easily seen.

Hobo log and/or hitchhiker - a free or unattached log that is picked up by a turn and is transported with the turn.

Hooktender - the worker that supervises the method of moving the logs from the woods to the landing.

Hot deck - a landing where logs are being moved.

Hydraulic jack - a mechanical device, powered by internal pressure, used to control the direction in which a tree is to be felled.

In the clear - a position within the work area where the probability of hazardous contact with falling trees, moving logs, rootwads, chunks, material, rigging and equipment is minimized by distance from the hazards and/or use of physical barriers, such as stumps, trees, terrain or other objects providing protection.

Examples:

- Back behind on the uphill side of the turn and out of reach of any upending logs.

- Out of the bight.

- In the logged off area.

- In a position where movement will not be obstructed.

Intermediate support system - a system for supporting a loaded skyline in a support jack by one of the two following methods:

- Double tree support - the skyline is suspended on a single piece of wire rope supported by two trees so that the load is shared between the two trees.

- Single tree support - the skyline is suspended on a single piece of wire rope, single-eyed choker or double-eyed strap supported by a single tree. The support tree may be vertical or leaning.

Jackstrawed - trees or logs piled in an unorderedly manner.

Jaggers - any projecting broken wire in a strand of cable.

Kerf - the part of timber products taken out by the saw teeth.

Knob - a metal ferrule attached to the end of a line.

Landing - any place where logs are laid after being yarded, awaiting subsequent handling, loading, and hauling.

Landing chute - the head of the skid trail or road where the logs are temporarily placed before handling, loading and hauling.

Lay -

- The straight-line distance it takes a strand of wire rope to make one complete spiral around the core of a rope.

- The position of a log in a pile, on a load, or in the fell and bucked.

Limbing - to cut branches off felled or standing trees.

Loading boom - any structure projecting from a pivot point to guide a log when lifted.

Lodged tree (hung tree) - a tree leaning against another tree or object which prevents it from falling to the ground.

Log - a tree segment suitable for subsequent processing into lumber, pulpwood, or other wood products, including, but not limited to, poles, piling, peeler blocks, sections and/or bolts.

Log bronco - a sturdily built boat usually from twelve to twenty feet in length, used to push logs or bundles of logs in a generally forward direction in booming and rafting operations.

Log dump - a place where logs are removed from transporting equipment. It may be either dry land or water, par-buckled over a brow log or removed by machine.

Log stacker - a mobile machine mounted on a wheeled or tracked chassis, equipped with a frontally mounted grapple, tusk, or forklift device, and employed in the loading, unloading, stacking, or sorting of logs.

Logging machine - a machine used or intended for use to yard, move, or handle logs, trees, chunks, trailers, and related materials or equipment.

Note: A self-loading log truck is only considered a logging machine when in use for loading and unloading.

Note: A helicopter is not considered a logging machine.

Logging operations - operations associated with felling and/or moving trees, logs, veneer bolts, poles, pilings, and other forest products from the stump to the point of delivery. Such operations are such, but not limited to, marking, felling, bucking, limbing, debarking, chipping, yarding, loading, unloading, storing, and the transporting of machines, equipment and personnel from one site to another.

Long sticks - an overlength log or tree length that creates a hazard by exceeding the safe perimeters of the landing.

Machine - a piece of stationary or mobile equipment having a self-contained power plant, that is operated off-road and used for the movement of material. Machines include but are not limited to tractors, skidders, front-end loaders, scrapers, graders, bulldozers, rough terrain logging shovels, log stackers and mechanical felling devices, such as tree shears and feller-bunchers.

Mainline - the line attached to the buttrigging used to pull logs to the landing.

Mainline block - the block hung in the portable spar or tower through which the mainline passes.

Mainline train - any train that is made up for travel between the woods and log dump.

Matchcutting - the felling of trees without using an undercut.

Mechanized falling - falling of standing timber by a self-propelled mobile wheeled or tracked machine equipped with a shear or other powered cutting device.

Mechanized feller - any such machine as described in WAC 296-54-541 and 296-54-543, and includes feller/bunchers and similar machines performing multiple functions.

Mechanized logging machine - a feller-buncher, single-grip harvester, processor, forwarder, clambunk, or log loader.

Mobile log loader - a self-propelled log loading machine mounted on wheels or tracks, incorporating a boom and employed in the loading or unloading of logs by means of grapples or tongs.

Mobile yarder - a logging machine mounted on wheels, tracks, or skids, incorporating a vertical or inclined spar, tower, or boom, employed in skyline, slackline, high lead or grapple overhead cable logging systems.

Molle - a single strand of wire rope rolled into a circle with six wraps. A molle can be used as a temporary method of connecting the eye splices of two lines. A molle is used in most pin shackles in place of a cotter key.

Must - the same as "shall" and is mandatory.

New job site - a location of operations when the loading station and/or the yarder or cutting operations are moved to a new area outside of the current sale or contracted unit.

Pass line - a small line threaded through a block at the top of the spar to assist the high climber.

Permissible (as applied to any device, equipment or appliance) - such device, equipment, or appliance has the formal approval of the United States Bureau of Mines, American Standards Association, or National Board of Fire Underwriters.

Portable spar or tower - a movable engineered structure designed to be used in a manner similar to which a wood spar tree would be used.

Qualified person - a person, who by possession of a recognized degree, certificate, professional standing, or by extensive knowledge, training, and experience, has successfully demonstrated ability to solve or resolve problems relating to the subject matter, the work, or the project.

Rated capacity - the maximum load a system, vehicle, machine or piece of equipment was designed by the manufacturer to handle.

Reach - a steel tube or wood timber or pole connected to the truck and inserted through a tunnel on the trailer. It steers the trailer when loaded and pulls the trailer when empty.

Reload - an area where logs are dumped and reloaded or transferred as a unit to another mode of transportation.

Rollway - any place where logs are dumped and they roll or slide to their resting place.

Root wad - the ball of a tree root and dirt that is pulled from the ground when a tree is uprooted.

R.O.P.S. - roll over protection structure.

Rub tree - a tree used to guide a turn around an area.

Running line/running rope - any moving line directly involved with the yarding of logs.

Safety factor - the ratio of breaking strength to a safe working strength or loading.

Safety glass - a type of glass that will not shatter when broken.

Sail block - a block hung inverted on the sail guy to hold the tong block in proper position.

Scaler - the person who measures the diameter and length of the logs, determines specie and grade, and makes deductions for footage calculations.

Serviceable condition - a state or ability of a tool, machine, vehicle or other device to operate as it was intended by the manufacturer to operate.

Shall - a requirement that is mandatory.

Shear log - a log placed in a strategic location to divert passage of objects.

Shore skids - any group of timbers spaced a short distance apart on which logs are rolled.

Should - means recommended.

Signal person - the person designated to give signals to the machine operator.

Siwash - to change the lead of a line with a physical object such as a stump or tree instead of a block.

Skidder - a machine or animal used to move logs or trees to a landing.

Skidding - movement of logs or trees on the surface of the ground to the place where they are to be loaded.

Skidding line - the main haulage line from a carriage to which chokers are attached. Sometimes referred to a mainline.

Skyline - the line suspended between two points on which a block or carriage travels.

Slackline - a form of skyline where the skyline cable is spooled on a donkey drum and can be raised or lowered.

Slack puller - any weight or mechanical device used to increase the movement of a line when its own weight is inadequate.

Slope (grade) - the increase or decrease in altitude over a horizontal distance expressed as a percentage. For example, change of altitude of 20 feet (6 m) over a horizontal distance of 100 feet (30 m) is expressed as a 20 percent slope.

Snag - a dead standing tree or a portion thereof. (See Danger tree)

Snorkel - a loading boom modified to extend its limitations for yarding.

Spar/spar tree - a tree or device (rigged for highlead, skyline or slackline yarding) used to yard logs by any method of logging.

Speeder - a small self-powered vehicle that runs on a railroad track.

Spike - a long heavy nail similar to a railroad spike.

Springboard - a board with an iron tip used by fallers to stand on while working above ground level.

Spring pole - a tree, segment of a tree, limb, or sapling which is under stress or tension due to the pressure or weight of another object.

Square lead - the angle of 90 degrees.

Squirrel - a weight used to swing a boom when the power unit does not have enough drums to do it mechanically.

Squirrel tree - a topped tree, guyed if necessary, near the spar tree in which the counter balance (squirrel) of a tree rigged boom is hung.

Standing line -

- Guyline

- A nonoperating rope with end terminations to support a boom or mast.

Stiff boom - two or more boom sticks wrapped together on which boom persons walk or work.

Strap - any short piece of line with an eye or "D" in each end.

Strap socket or D - a socket with a closed loop arranged to be attached to the end of a line by the molten zinc, or an equivalent method. It is used in place of a spliced eye.

Strawline - a light cable used in rigging up, or in moving other cables or blocks. The smallest line on the yarder. (Mainline - haulback line - strawline.)

Strip - a definite location of timber on which one or more cutting crews work.

Swamping - the falling or cutting of brush around or along a specified place.

Swede connection - a line configuration made by wrapping two choker lines in the same direction around a tree or log connecting the line knobs to opposite line bells.

Swifter - a piece of equipment used to tie the side sticks of a log raft together to keep the raft from spreading.

Swing cut - an intentional dutchman left on one corner of an undercut or a backcut in which the holding wood on one side is cut through in conjunction with an intentional dutchman to achieve a desired lay for the tree being fell.

Tail block - a block used to guide the haulback line at the back corner of the yarding area.

Tail hold - an anchor used for making fast any line or block.

Tail/lift tree - the tree at the opposite end from the head tree on which the skyline or other type rigging is hung.

Tie back - to use a twister(s) (or similar system/device) that has a breaking strength equal to fifty percent of the

breaking strength of the mainline or skyline whichever is greater. To secure or support one anchor by securing it to a second anchor(s) such as wrapping one stump and choking another.

Tie down - a chain, cable, steel strips or fiber webbing and binders attached to a truck, trailer or other conveyance as a means to secure loads and to prevent them from shifting or moving when they are being transported.

Tight line - when either the mainline or haulback are held and power is exerted on the other or when power is exerted on both at the same time.

Tong line block - the block hung in a boom through which the tong line operates.

Tongue - a device used to pull and/or steer a trailer.

Topping - cutting off the top section of a standing tree.

Tower - (see portable spar or tower).

Tractor - a machine of wheel or track design used in logging.

Tractor logging - the use of any wheeled or tracked vehicle in the skidding or yarding of logs.

Transfer (as used in loading) - changing of logs in a unit from one mode of transportation to another.

Tree jack - a grooved saddle of wood or metal rollers contained within two steel plates, attached to a tree with a strap, used as a guide for skyline, sail guy, or similar static line. It is also formed to prevent a sharp bend in the line.

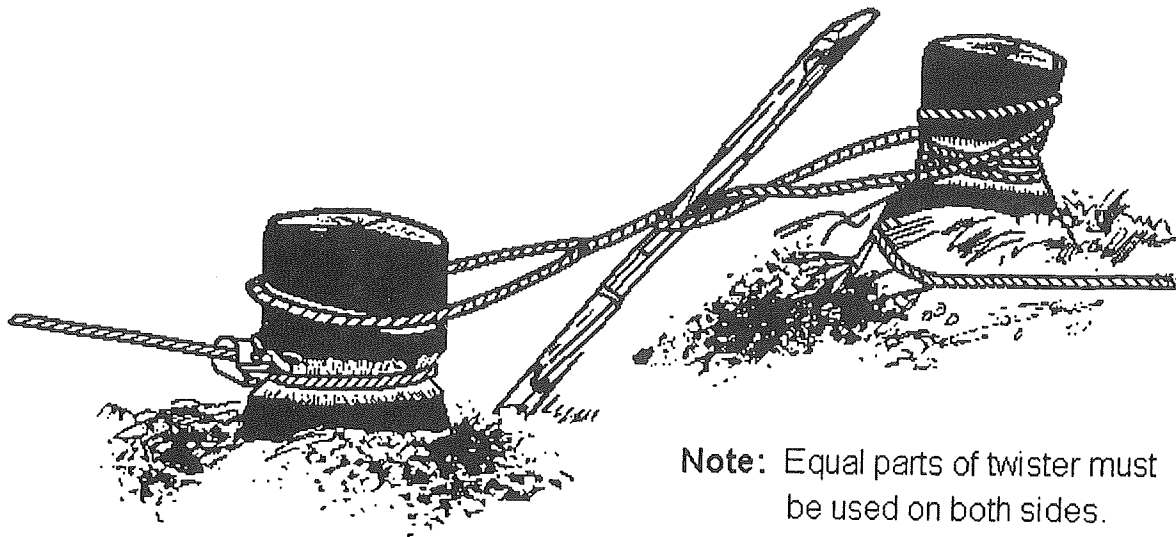
Tree plates - steel bars sometimes shaped as elongated J's, which are fastened near the top of a tree to hold guylines and prevent them from cutting into the tree when tightened. The hooks of the J are also used to prevent the mainline block strap from sliding down the tree.

Tree pulling - a method of falling trees in which the tree is pulled down with a line.

Tug - a boat, usually over twenty feet in length, used primarily to pull barges, booms of logs, bags of debris, or log rafts.

Turn - any log or group of logs attached by some means to power and moved from a point of rest to a landing.

Twister - a line (usually small diameter wire rope "hay-wire") that supports a tailhold stump, guyline stump, or tree that does not appear to be strong enough. This is done by connecting the tailhold to another stump or tree opposite by wrapping the two with a line. This line is then tightened by placing a piece of large-diameter limb between the wrappings and twisting them together.



Note: Equal parts of twister must be used on both sides.

TWISTER ROPE

Undercut - a notch cut in a tree to guide the direction of the tree fall and to prevent splitting or kickback.

V-lead - a horizontal angle of less than ninety degrees formed by the projected lines of the mainline from the drum of the logging machine through the block or fairlead and the yarding log or turn.

Vehicle/crew bus - a car, bus, truck, trailer or semi-trailer owned, leased, or rented by the employer that is used for transportation of employees or movement of material.

WAC - Washington Administrative Code.

Waistline - that portion of the haulback running between the corner block and the tail block.

Winching - the winding of cable or rope onto a spool or drum.

Within the stakes - when one-half the log diameter is below the stake top.

Work areas - any area frequented by employees in the performance of assigned or related duties.

Wrapper - a cable assembly or chain used to contain a load of logs.

Wrapper rack - barrier used to protect a person while removing binders and wrappers from a loaded logging truck.

Yarder (donkey) - a machine with a series of drums used to yard logs.

Yarding - the movement of logs from the place they are felled to a landing.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-505, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-505, filed 10/28/96, effective 1/1/97. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-54-505, filed 11/30/87. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-505, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-505, filed 9/21/79.]

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WAC 296-54-507 Employer's responsibilities. The employer must comply with the requirements of all safety and health regulations and must:

(1) Provide safety training for new employees.

(2) Take additional precautions to ensure safe logging operations when extreme weather or other extreme conditions create hazards. If the logging operation cannot be made safe, the work must be discontinued until safe to resume.

(3) Ensure that danger trees within reach of landings, rigging, buildings, or work areas are either felled before regular logging operations begin, or arrange work so that employees are not exposed to the related hazards.

(4) Develop and maintain a hazard communication program as required by chapter 296-62 WAC, Part C. The program must provide information to all employees about hazardous chemicals or substances to which they are exposed, or may become exposed, in the course of their employment.

(5) Ensure that intoxicating beverages and narcotics are prohibited on or near the worksite. The employer must remove from the worksite any employee under the influence of alcohol or narcotics.

Note: Narcotics do not include prescription drugs taken under a doctor's direction if the use does not endanger any employee.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-507, filed 8/18/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-54-507, filed 8/3/94, effective 9/12/94; 89-11-035 (Order 89-03), § 296-54-507, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-507, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-507, filed 9/21/79.]

WAC 296-54-509 Employee's responsibility. (1) Employees must coordinate and cooperate with the employer and other employees in an attempt to eliminate accidents.

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(2) Employees must be aware of and follow all safe practices that apply to their work.

(3) Employees should offer safety suggestions that may contribute to a safer work environment.

(4) Intoxicating beverages and narcotics must not be permitted or used by employees in or around the worksites. Employees under the influence of alcohol or narcotics must not be permitted on the worksite.

EXCEPTION: This rule does not apply to employees taking prescription drugs and/or narcotics as directed by a physician if the use does not endanger the employee or others.

(5) Employees must conduct themselves in a workman-like manner while on the worksite.

(6) Employees must make prompt report to their immediate supervisor of each industrial injury or occupational illness, regardless of the degree of severity.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-509, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-509, filed 9/21/79.]

WAC 296-54-511 Personal protective equipment (PPE). (1) Protective equipment, including personal protective equipment for eyes, face, head, hearing and extremities, protective clothing, respiratory devices and protective shields and barriers, must be used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

(2) Personal protective equipment, including any personal protective equipment provided by an employee, must be maintained in a serviceable condition.

(3) Design. All personal protective equipment must be of safe design and construction for the work to be performed. All safety belts and attachments must meet the requirements of section 3 of ANSI A10.14-1975.

(4) Personal protective equipment, including any personal protective equipment provided by an employee, must be inspected before initial use during each workshift. Defects or damage must be repaired or the unserviceable personal protective equipment must be replaced before work is commenced.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-511, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-511, filed 10/28/96, effective 1/1/97. Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-54-511, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-54-511, filed 11/30/83. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-511, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-511, filed 9/21/79.]

WAC 296-54-51110 Head protection. The employer must provide, at no cost to the employee, and ensure that all employees involved in the logging operation or any of its related activities wear head protection, unless the employees

are protected by FOPS, cabs, or canopies meeting the requirements of this chapter.

(1) Hard hats purchased after February 20, 1995, must meet the requirements of ANSI Z89.1-1986, "American National Standard for Personnel Protection—Protective Headwear for Industrial Workers—Requirements," or the employer must demonstrate that they are equally effective.

(2) Hard hats purchased before February 20, 1995, must meet the requirements of ANSI Z89.1-1969, "American National Standard Safety Requirements for Industrial Head Protection," or the employer must demonstrate that they are equally effective.

(3) Hard hats must be maintained in serviceable condition.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51110, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51120 Eye and face protection. The employer must provide, at no cost to the employee, and ensure that each employee wears:

(1) Eye protection meeting the requirements of chapter 296-24 WAC, Part A-2, where there is potential for eye injury from falling or flying objects; and

(2) Face protection meeting the requirements of chapter 296-24 WAC, Part A-2, where there is potential for facial injury such as, but not limited to, operating a chipper. An employee using a chain saw may use either eye or face protection.

Note: The employee does not have to wear separate eye protection when the face protection also covers the eyes.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51120, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51130 Hearing protection. The employer must provide hearing protection when required by the general occupational health standards, chapter 296-62 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51130, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51140 Hand protection. (1) Each employee handling wire rope or other rough materials must wear hand protection that provides adequate protection from puncture wounds, cuts, and lacerations.

(2) Hand protection must be maintained in serviceable condition.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51140, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51150 Respiratory protection. The employer must provide respiratory protection when required by the general occupational health standards, chapter 296-62 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51150, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51160 Leg protection. (1) The employer must provide, at no cost to the employee, and ensure that each employee who operates a chain saw wears leg protection con-

structured with cut-resistant material, such as ballistic nylon. The leg protection must cover the full length of the thigh to the top of the boot on each leg to protect against contact with a moving chain saw.

EXCEPTION: This requirement does not apply to an employee working aloft in trees when supported by climbing spurs and climbing belt, or when an employee is working from a vehicle-mounted elevating and rotating work platform meeting the requirements of chapter 296-24 WAC, Part J-2, Vehicle-mounted elevating and rotating work platforms.

(2) Leg protection must be maintained in serviceable condition.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51160, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51170 Foot protection. (1) Each employee must wear foot protection that covers and supports the ankle, such as heavy-duty logging boots.

(2) Each employee who operates a chain saw must wear cut resistant foot protection that will protect the employee against contact with a running chain saw.

For example: Leather logging boots, insulated rubber pacs, and rubber boots with cut protection will meet the cut-resistant requirement of this section.

(3) All employees whose duties require them to walk on logs or boomsticks must wear sharp-calked boots, or the equivalent.

EXCEPTION 1: When calks are ineffective because of ice, snow, or other conditions and other footwear does not provide suitable protection, employees must be prohibited from working on logs or boomsticks.

EXCEPTION 2: The employer may allow employees to wear nonslip boots instead of calks when the nonslip boots provide greater employee protection than calks (such as at scaling stations, log sorting yards, etc.). The nonslip boots must still provide firm ankle support and secure footing.

(4) Foot protection must be maintained in serviceable condition.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51170, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51180 Personal flotation devices. (1) Employees working on, over, or along water, where there is a danger of drowning, must be provided with and wear approved personal flotation devices.

(2) Employees are not considered exposed to the danger of drowning when:

(a) The water depth is known to be less than chest deep on the exposed individual;

(b) Employees work behind standard height and strength guardrails;

(c) Employees work inside operating cabs or stations that will prevent accidentally falling into the water; or

(d) Employees wear approved safety belts with lifeline attached to prevent falling into the water.

(3) Before and after each use, personal flotation devices must be inspected for defects that would reduce their designed effectiveness. Using a defective personal flotation device is prohibited.

(4) An approved personal flotation device must be approved by the United States Coast Guard as a Type I PFD,

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Type II PFD, Type III PFD, or Type V PFD, or their equivalent, as required in 46 CFR 160 (Coast Guard Lifesaving Equipment Specifications) and 33 CFR 175.23 (Coast Guard table of devices equivalent to personal flotation devices). Ski belt or inflatable personal flotation devices are prohibited.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51180, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51190 Highly visible clothing. (1) Employees working on landings or in log sorting yards on or from the ground, must wear highly visible hard hats, yellow or orange vests, or other similarly colored garments, to make employees more visible to equipment operators.

Note: The department recommends that hard hats and vests or outer garments be luminous or reflective.

(2) An employee working as a flagger must wear a hard hat and vest or other garment of high visibility colors. Warning vests and hard hats worn at night must be reflective.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51190, filed 8/18/99, effective 12/1/99.]

WAC 296-54-513 Arrangement of work areas and emergency contact. (1) Employee work areas must be spaced and employee duties organized so the actions of one employee do not create a hazard for any other employee.

(2) Work areas must be assigned so that:

(a) Trees cannot fall into an adjacent occupied work area;

(b) The distance between work areas is at least two tree lengths of the trees being fell;

(c) The distance between work areas reflects the degree of slope, the density of the growth, the height of the trees, the soil structure and other hazards reasonably anticipated at the worksite; and

(d) A distance of more than two tree lengths is maintained between work areas on any slope where rolling or sliding of trees or logs is reasonably foreseeable.

(3) Each employee must be within visual, audible, or radio/telephone contact with another person who can assist in case of emergency.

(4) In any logging operation where cutting, yarding, or loading are performed, there must be at least two employees working as a team.

(5) Each employee must have visual or audible signal contact with another employee as often as this schedule requires:

(a) Cutters - 30 minutes.

(b) All other employees - 2 hours, which allows for making layouts, notching guyline stumps, etc., during normal work hours.

Exception: The requirements for a two-person team and check-in schedule do not apply to operators of motor vehicles, mechanized logging machines, watchpersons or certain other jobs which, by their nature, are singular employee assignments. However, a procedure for checking the welfare of these employees during their working hours must be instituted and all employees so advised.

(6) Mechanics or other employees must not be assigned to work on equipment by themselves when there is a probability of a fall from elevated work locations or equipment.

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Also, if the work is of such nature that heavy parts require moving, or there is a probability that anything heavy could fall on the person, there must be another person in the immediate area to render assistance.

(7) The employer must establish a method of checking the employees in from the woods at the end of each shift, including operators of all movable equipment. Each immediate supervisor must account for their crew.

(8) Each worksite must have at least one serviceable and operable two-way radio, phone, or radio/phone combination available to reach emergency service. Citizen band radios are permitted only as a secondary means of communication.

(9) Each worksite must have an emergency medical plan to ensure rapid emergency medical care for employees with major illnesses and injuries. The plan must be in writing and include the following:

(a) Township, range, and section numbers or latitude and longitude or UMS Grid System coordinates;

(b) Directions by road, or escort provisions to the site;

(c) Telephone number of emergency medical services; and

(d) Provisions for emergency vehicle(s) access, when working behind locked gate(s).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-513, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-513, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-513, filed 9/21/79.]

WAC 296-54-515 Accident prevention program. (1)

The employer must develop a formal accident prevention program, tailored to the needs of the particular logging operation and to the type of hazards involved.

(2) The accident prevention program must be in writing.

(3) The accident prevention program must cover at least the following elements:

A safety training program that describes the employer's total safety program.

(a) How and when to report injuries;

(b) The location of first aid supplies;

(c) How to report unsafe conditions and practices;

(d) The use and care of required personal protective equipment;

(e) An on-the-job review of the practices necessary to perform job assignments safely; and

(f) Recognition of safety and health hazards associated with the employee's specific work tasks, including using measures and work practices to prevent or control those hazards.

(4) The employer must document and maintain current records of required training, including:

• Who was trained;

• The date(s) of the training; and

• The signature of the trainer or the employer.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-515, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-515, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-515, filed 8/20/80. Statutory Authority: RCW 49.17.040,

[Title 296 WAC—p. 1208]

49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-515, filed 9/21/79.]

WAC 296-54-51510 Safety and health meetings. (1)

The employer must hold safety and health meetings at the following intervals:

(a) Each time the employer moves to a new jobsite; and

(b) Monthly after the initial jobsite meeting.

(2) Safety and health meetings may be conducted individually, in crew meetings, in larger groups, or as part of other staff meetings.

(3) Attendance and subject(s) must be documented.

Note: When moving to a new jobsite, site specific hazards should be identified and discussed during the prejob safety meeting.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51510, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51520 First-aid training. (1)

Each employee, including supervisors, must receive or have received first-aid and CPR training. New employees not holding a valid first-aid card must be trained within a reasonable time, not to exceed six months from hiring.

EXCEPTION: Log truck drivers are not required to receive first-aid and CPR training if they are not involved with falling, yarding, loading, or processing logs.

(2) Each employee's first-aid and CPR training and/or certificate of training must be current.

(3) At least two persons holding a valid certificate of first aid training must be present or available at all times in sorting yard operations.

(4) First-aid and CPR training must cover at least the following:

(a) The definition of first aid.

(b) Legal issues of applying first aid (Good Samaritan Laws).

(c) Basic anatomy.

(d) Patient assessment and first aid for the following:

• Respiratory arrest.

• Cardiac arrest.

• Hemorrhage.

• Lacerations/abrasions.

• Amputations.

• Musculoskeletal injuries.

• Shock.

• Eye injuries.

• Burns.

• Loss of consciousness.

• Extreme temperature exposure (hypothermia/hyperthermia).

• Paralysis.

• Poisoning.

• Artificial ventilation.

(e) CPR.

(f) Applying dressings and slings.

(g) Treating strains, sprains, and fractures.

(h) Immobilizing injured persons.

(i) Handling and transporting injured persons.

(j) Treating bites, stings, or contact with poisonous plants or animals.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51520, filed 8/18/99, effective 12/1/99.]

WAC 296-54-51530 First-aid kits. (1) The employer must provide first-aid kits:

(a) At each worksite where trees are being cut (e.g., falling, bucking, limbing);

(b) At each active landing/logging site; and

(c) In the absence of readily accessible first-aid supplies such as first-aid kits, first-aid stations, first-aid rooms or their equivalent, all transport vehicles, log trucks, speeders, road graders and similar equipment must be equipped with not less than a ten package first-aid kit; and

(d) The number of first-aid kits and the content of each kit must reflect the degree of isolation, the number of employees, and the hazards reasonably anticipated at the worksite.

(2) Following is the minimally acceptable number and type of required first-aid supplies to meet the requirements of subsection (1)(a) and (b) of this section.

Note: The contents of the first-aid kit listed should be adequate for small worksites of two or three employees. For larger or multiple logging operations conducted at the same location, the employer should provide additional first-aid kits or additional quantities of supplies in the first-aid kits.

(a) Gauze pads (at least 4 x 4 inches).

(b) Two large gauze pads (at least 8 x 10 inches).

(c) Box adhesive bandages (band-aids).

(d) One package gauze roller bandage at least 2 inches wide.

(e) Two triangular bandages.

(f) Wound cleaning agent such as sealed moistened towlettes.

(g) Scissors.

(h) At least one blanket.

(i) Tweezers.

(j) Adhesive tape.

(k) Latex gloves.

(l) Resuscitation equipment such as resuscitation bag, airway, or pocket mask.

(m) Two elastic wraps.

(n) Splint.

(o) Stretcher.

(3) Transport vehicles, log trucks, speeders and road graders must have at least the following number and type of first-aid supplies:

10 package kit.

1 pkg. adhesive bandages, 1" (16 per pkg.).

1 pkg. bandage compress, 4" (1 per pkg.).

1 pkg. scissors and tweezers (1 each per pkg.).

1 pkg. triangular bandage, 40" (1 per pkg.).

1 pkg. antiseptic soap or pads (3 per pkg.).

5 pkgs. employer's choice.

(4) When six or more employees are generally being transported on any one trip, the first-aid kit must be increased in size following the requirements of subsection (2) of this section. Subsection (2)(h), (n) and (o) are optional.

(5) The employer must maintain the contents of each first-aid kit in a serviceable condition.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-51530, filed 8/18/99, effective 12/1/99.]

(2001 Ed.)

WAC 296-54-517 Lockout/tagout procedures. (1)

The employer must establish and implement written procedures for lockout/tagout to prevent the accidental start up or release of stored energy of logging machinery that is shut down for repairs, maintenance, or adjustments.

(2) Lockout/tagout procedures must contain specific steps for:

(a) Shutting down, blocking, and securing machines to control hazardous energy;

(b) Locking and/or tagging out machinery; and

(c) Release from lockout/tagout.

(3) Lockout/tagout procedure details must include at least the following:

(a) Employees performing maintenance, repairs, or adjustments have knowledge of the hazardous energy to be controlled and the means to control the energy.

(b) Logging machine shutdown.

• Apply brakes, swing locks, etc.

• Place the transmission in the manufacturer's specified park position.

• Lower to the ground or secure each moving element such as, but not limited to, blades, booms, grapples, buckets, saws, and shears to prevent a release of stored energy.

• Shut down machinery and ensure that a responsible person removes and maintains possession of the ignition/master key.

• Engage hydraulic safety locks when applicable.

• Before working on hydraulic or air systems, relieve pressure by bleeding tanks or lines and operate controls to dissipate residual stored energy (pressure).

• Place lockout and/or tagout device.

(4) Release from lockout/tagout. Before lockout or tagout devices are removed and machinery is started, the work area must be inspected to ensure that all tools have been removed, guards are replaced, and employees are in the clear.

(5) The employer must provide padlocks and/or tags for locking and/or tagging out logging machinery that are durable enough to withstand the environment.

(6) Tags must have a legend such as "do not start" or "do not operate." Tags must be placed so they are obvious to anyone attempting to operate the machinery.

Note: In lockout, padlocks are commonly used to prevent access to ignition/master switches or battery disconnects.

(7) Energy sources. Stored or residual energy such as that in elevated machine members, rotating saws, hydraulic systems, air pressure and springs, must be dissipated or restrained by methods such as grounding, repositioning, blocking, chaining, bleeding down, etc.

(8) The employer must provide training to ensure that the purpose and function of the lockout/tagout program are understood by employees performing maintenance, repairs, or adjustments covered by this section. This program must be reviewed at least annually and training provided as needed. This training may be accomplished through safety meetings.

Note: See appendix 2 for a sample lockout/tagout program (energy control program).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-517, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-517, filed 8/20/80. Statutory Authority:

RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-517, filed 9/21/79.]

WAC 296-54-519 Miscellaneous requirements. (1) Spikes, drift bolts, nails, or other metal must not be left in any recoverable log.

(2) The employer must provide and maintain portable fire extinguishers on each machine and vehicle.

(3) Machines, vehicles, and portable powered tools (unless diesel powered) must not be fueled while the motors are running.

Note: See WAC 296-54-58130(3) for exceptions related to helicopters.

(4) Flammable and combustible liquids must be stored, handled, transported, and used according to the requirements of chapter 296-24 WAC, Part E, and the following:

(a) Flammable and combustible liquids must not be transported in the driver compartment or in any passenger-occupied area of a machine or vehicle.

(b) Flammable or combustible liquids, including chain-saw and diesel fuel, may be used to start a fire, if the employer ensures that in the particular situation its use does not create a hazard for an employee.

(5) Smoking is prohibited in battery charging areas and within fifty feet of all refueling operations. Precautions must be taken to prevent open flames, sparks, or electric arcs in battery charging or refueling areas.

(6) When charging batteries:

(a) The vent caps must be kept in place to avoid electrolyte spray;

(b) Caps must be functioning; and

(c) The battery (or compartment) cover(s) must be open to dissipate heat.

(7) Tools and other metallic objects must be kept away from the tops of uncovered batteries.

(8) Explosives and blasting agents must be stored, handled, transported, and used according to the requirements of chapter 296-52 WAC, Possession and handling of explosives.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-519, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-519, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-519, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-519, filed 9/21/79.]

WAC 296-54-521 Motor vehicles. (1) The seats of each vehicle must be securely fastened.

(2) Each school bus type vehicle that will transport nine or more passengers must have a substantial barricade behind the driver. The barricade must extend from the floor to at least a level even with the top of the driver's head.

(3) Adequate provision must be made for safe entrance and exits. Each vehicle must have mounting steps and handholds wherever it is necessary to prevent an employee injury when entering or leaving the vehicle.

(4) When equipment or tools are carried inside the vehicle, the employer must provide and use racks, boxes, holsters or other means to transport tools so that a hazard is not created for any vehicle operator or passenger.

(5) No one may enter or exit any vehicle until the vehicle is completely stopped.

(6) Employees must keep all parts of the body within the vehicle.

(7) Heat and light must be available in the passenger area of the vehicle. Use of stoves in vehicles is prohibited.

(8) Vehicles designed to transport nine or more passengers must have an emergency exit that:

(a) Is at least six and one-half square feet in area, with the smallest dimension being at least 18 inches;

(b) Is placed at the back of the vehicle or near the back on the side opposite the regular entrance; and

(c) Has an unobstructed route to and from the exit.

(9) When no fuel is transported in the crew vehicle, a minimum rated 5/BC dry chemical fire extinguisher must be kept in the passenger compartment. When fuel is transported on the crew vehicle according to subsection (12) of this section, a minimum rated 10/BC dry chemical fire extinguisher must be kept in the passenger compartment. The extinguishing agent must be nontoxic and preferably noncorrosive.

(10) Exhaust systems must be designed and maintained to eliminate the exposure of passengers to toxic agents.

(11) Operating and maintenance instructions must be available in each vehicle. Each vehicle operator and maintenance employee must comply with the operating and maintenance instructions.

(12) Fuel must be transported or stored only in approved safety containers. Enclosed areas where fuels are carried or stored must be vented so that a hazardous concentration of fumes cannot accumulate. All containers or drums must be properly secured to the vehicle while being transported. Commercially built pick-up or flatbed trucks with a maximum seating capacity of six persons may be used to carry fuel in or on the bed of such vehicles, if the fuel is not carried in the crew compartment. Van-type vehicles may be used to carry fuel only when a vapor-proof bulkhead is installed between the passenger compartment and storage compartment. A maximum of forty-two gallons of gasoline may be carried or stored in the compartment and each container must have a maximum capacity seven gallons.

(13) Motor vehicles used regularly to transport employees must be covered against the weather and equipped and operated according to applicable state of Washington motor vehicle laws.

(14) All operators of crew vehicles must be experienced drivers and have a valid operator's license for the class of vehicle being operated.

(15) Dump trucks must only be used in an emergency to transport workers and have adequate safety chains or locking devices that eliminate the possibility of the body of the truck being raised while employees are riding in the truck. "Emergency" means any unforeseen circumstances that call for immediate action when danger to life or danger from fire exists.

(16) An effective means of signaling must be provided for communication between the driver and the passengers being transported when they are in separate compartments.

(17) The passenger load limit of a crew vehicle must not exceed the seating capacity of the vehicle.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-521, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-531, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-531, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-531, filed 9/21/79.]

WAC 296-54-523 Inspection and repair of equipment and vehicles. Defective equipment.

(1) Equipment in need of repair must be reported to management as soon as possible and such equipment must not be used until repairs are completed if there is a possible hazard to safety of the operator or other employees.

(2) Each vehicle used to perform any logging operation must be inspected before initial use during each workshift. Defects or damage must be repaired or the unserviceable vehicle must be replaced before work is commenced.

(3) Each vehicle, machine and piece of equipment used to perform any logging operation must be maintained in serviceable condition.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-523, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-521, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-521, filed 9/21/79.]

WAC 296-54-527 Seat belts. Each machine equipped with ROPS and each vehicle (whether provided by the employee or the employer) must meet the following requirements:

(1) A seat belt must be provided for each vehicle, vehicle occupant, and all machines equipped with ROPS.

Note: An employer is not required to retrofit a machine or vehicle that was not equipped with seat belts at the time of manufacture.

(2) Each employee must use the available seat belt while the vehicle or machine is being operated.

EXCEPTION: During road construction operations ONLY, when road building machine operators are faced with a significant steep and deep cliff on the side, a seat belt is not required to be worn, if the employee's immediate supervisor approves of such action.

(3) Each employee must securely and tightly fasten the seat belt to restrain the employee within the vehicle or machine cab.

(4) Each machine seat belt must meet the requirements of the Society of Automotive Engineers Standard SAE J386, June 1985, "Operator Restraint Systems for Off-Road Work Machines." Seat belts need not be provided for equipment that is designed for stand-up operations.

(5) Seat belts must not be removed from any vehicle or machine. The employer must replace each seat belt that was removed from any vehicle or machine that was equipped with seat belts at the time of manufacture.

(6) Each seat belt must be maintained in a serviceable condition.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-527, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-529, filed 10/28/96, effective 1/1/97. Statutory Authority:

RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-529, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-529, filed 9/21/79.]

WAC 296-54-529 Overhead electrical lines clearance. One of the following conditions must exist in work areas where equipment or machines are operated near electrical distribution and transmission lines:

(1) The lines have been de-energized and visibly grounded at the point of work;

(2) Insulating barriers that are not a part of or an attachment to the equipment or machinery are erected to prevent physical contact with the lines; or

(3) All of the following requirements are met:

	Line Voltage	Required minimum clearance between lines and any part of equipment or machine
(a)	50 kV or below	ten feet
(b)	over 50 kV	ten feet plus 0.4 inch for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than ten feet
For equipment or machinery in transit with no load and any boom or extended equipment lowered:		
(c)	50 kV or below	four feet
(d)	50-345 kV	ten feet
(e)	345-750 kV	sixteen feet

(4) Someone must be designated to observe proper clearance and to give timely warning for all operations where it is difficult for the operator to see well enough to maintain the clearance.

(5) All overhead wires shall be considered energized unless the line owner or the electrical utility authorities ensure that it is not an energized line and has been visibly grounded.

(6) Special precautions must be taken to prevent trees from falling into power lines. The employer must notify the power company immediately if a felled tree makes contact with any power line. Before falling any tree that appears will hit a power line, the employer must notify the power company. If a tree does contact a power line, all employees must remain clear of the area until the power company ensures that there is no electrical hazard.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-529, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-527, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-527, filed 9/21/79.]

WAC 296-54-531 Truck roads. (1) Haul road grades must not exceed 20 percent unless:

(a) Special equipment and safety measures are used to accommodate the steep grade; or

(b) The logging equipment or truck is specifically designed and approved by the manufacturer for operation on grades over twenty percent.

(2) Truck road surfaces must meet the following requirements:

(a) Truck roads are wide enough and even to ensure the safe operation of equipment.

(b) Hazards such as broken planking, deep holes, large rocks, logs, etc., that make equipment operation unsafe, must be immediately corrected.

(c) On blind curves, one of the following must be implemented:

(i) Truck roads are wide enough for two trucks to pass;

(ii) A signal system is maintained; or

(iii) Speed is limited so that the vehicle can be stopped in one-half the visible distance.

(3) For all portions of roads under the direct control of the employer, the employer must ensure that:

(a) All danger trees are felled a safe distance back from the roadway;

(b) Rocks that present a hazard are cleared from banks; and

(c) Brush and other materials that obstruct the view at intersections or on sharp curves are cleared.

(4) All bridge structures used in the logging operation must meet the following requirements:

(a) Structures are adequate to support the maximum imposed loads without exceeding the maximum safe working unit stresses;

(b) Bridges have an adequate number of reflectors to clearly define the entrance to the bridge;

(c) Structures are maintained in good condition and repair;

(d) Structures are inspected at least annually by a qualified authorized person; and

(e) A record maintained of each inspection must be available to a representative of the department on request.

(5) Shear rails must be installed on both outside edges of bridges. The shear rails must be securely fastened and made of material able to withstand the impact generated by contact with the wheels of a loaded vehicle. The top of shear rails must be at least fifteen inches above the bridge surface. Bridges in use before 1980 with outside shear rails a minimum of ten inches high or center shear rails at least five inches high are permissible until repairs are needed.

(6) The employer must implement measures that minimize dust to the degree that visibility is sufficient to allow an operator to safely operate a vehicle. Vehicle operators must travel at a speed consistent with road conditions.

(7) Pneumatic-tired equipment must have fenders as described in the Society of Automotive Engineers Technical Report J321a.

(8) Employee(s) must be assigned to flag on roads or provide other equivalent protection where hazardous conditions are created from logging such as but not limited to:

(a) Running wire rope lines or rigging across road grades, excluding guylines and standing skylines if lines remain a safe distance above the road to allow a vehicle to pass under; or

(b) The movement of logs, chunks, or debris across or suspended over road grades.

EXCEPTION: Where there is no through traffic, such as on a dead end road or where the property owner's permission or proper authority is granted to close a section of road, warning signs and barricades may be used instead of flagger(s).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-531, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-533, filed 9/21/79.]

WAC 296-54-533 Road pioneering and earthwork.

(1) Banks at the borrow area must be sloped to prevent slides.

(2) Backfill must be firmly compacted.

(3) Roadside banks must be sloped or stabilized to prevent slides.

(4) Overhanging banks, large rocks and debris must be removed or secured.

(5) Where riprap is used, the material and design must ensure containment of material.

(6) Trees or snags that may fall into the road must be felled.

(7) Root wads, logs, and other unstable debris must not be placed against standing timber or otherwise placed so as to create a hazard for timber falling or other logging operations.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-533, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-535, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-535, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-535, filed 9/21/79.]

WAC 296-54-535 Hand and portable powered tools.

(1) Each hand and portable powered tool, including any tool provided by an employee, must be maintained in serviceable condition.

(2) Each tool, including any tool provided by an employee, must be inspected before initial use during each workshift. The inspection must include at least the following:

(a) Handles and guards, to ensure that they are sound and tight-fitting, (properly shaped, free of splinters and sharp edges, and in place);

(b) Controls, to ensure proper function;

(c) Chain saw chains, to ensure proper adjustment;

(d) Chain saw mufflers, to ensure that they are operational and in place;

(e) Chain brakes and/or nose shielding devices, to ensure that they are in place and function properly;

(f) Heads of shock, impact-driven and driving tools, to ensure that there is no mushrooming.

(3) Each tool must be used and maintained according to the following requirements:

(a) Each tool is used only for purposes for which it was designed.

(b) Any shock, impact-driven or driving tool is repaired or removed from service when the head begins to chip.

(c) The cutting edge of each tool is sharpened according to manufacturer's specifications whenever it becomes dull during the workshift.

(d) Each tool is stored in the provided location when not being used at a worksite.

Note: See WAC 296-24-650 for rules on the use and maintenance of tools and other equipment not covered by this chapter.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-535, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-523, filed 10/28/96, effective 1/1/97. Statutory Author-

ity: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-523, filed 9/21/79.]

WAC 296-54-537 Chain saws. (1) Operators must inspect chain saws daily to ensure that handles and guards are in place, and controls and other moving parts are functional.

(a) Each chain saw placed into initial service after February 9, 1995, must be equipped with a chain brake and, shall otherwise meet the requirements of ANSI B175.1-1991 "Safety Requirements for Gasoline-Powered Chain Saws" and the requirements of this chapter;

(b) Each chain saw placed into service before February 9, 1995, must be equipped with a protective device that minimizes chain saw kickback, i.e., reduced kick back bar, chains, bar tip guard, or chain brake; and

(c) No chain saw kick back device shall be removed or otherwise disabled.

(2) Saw pinching and subsequent chain saw kickback must be prevented by using wedges, levers, guidelines, and saw placement, or by undercutting.

(3) Chain saws must be:

(a) Shutoff while fueling;

(b) Fueled outdoors at least ten feet from anyone smoking or from other potential sources of ignition; and

(c) Started at least 10 feet (3 m) from the fueling area.

(4) Chain saws must have a positive means of stopping the engine.

(5) Unless the carburetor is being adjusted, the chain saw must be shut off before any adjustments or repairs are made to the saw, chain, or bar.

(6) Using a chain saw with a faulty clutch is prohibited.

(7) The bar must be handled only when the chain saw motor is shut off.

(8) The drive end of the chain saw bar must be guarded.

(9) The chain saw must have an automatic throttle control that will return the engine to idle speed when the throttle is released.

Note: Idle speed is when the engine is running and the chain does not rotate on the bar.

(10) The chain saw must be started on the ground, log or where otherwise firmly supported. Drop starting a chain saw is prohibited.

(11) A chain saw must be held with the thumbs and fingers of both hands encircling the handles during operation unless the employer demonstrates that a greater hazard is posed by keeping both hands on the chain saw in a specific situation.

(12) The chain saw must be carried in a manner that will prevent operator contact with the cutting chain and muffler.

(13) The chain saw must be shut off or at idle before the faller starts to retreat.

(14) The chain saw must be shut down or the chain brake engaged whenever a saw is carried:

(a) Further than 50 feet (15.2 m); or

(b) Less than 50 feet if conditions such as, but not limited to, the terrain, underbrush, and slippery surfaces, may create a hazard for an employee.

(15) Using a chain saw to cut directly over head is prohibited.

(16) The chain saw operator must be certain of footing before starting to cut. The chain saw must not be used in a position or at a distance that could cause the operator to become off-balance, to have unsteady footing, or to relinquish a firm grip on the saw.

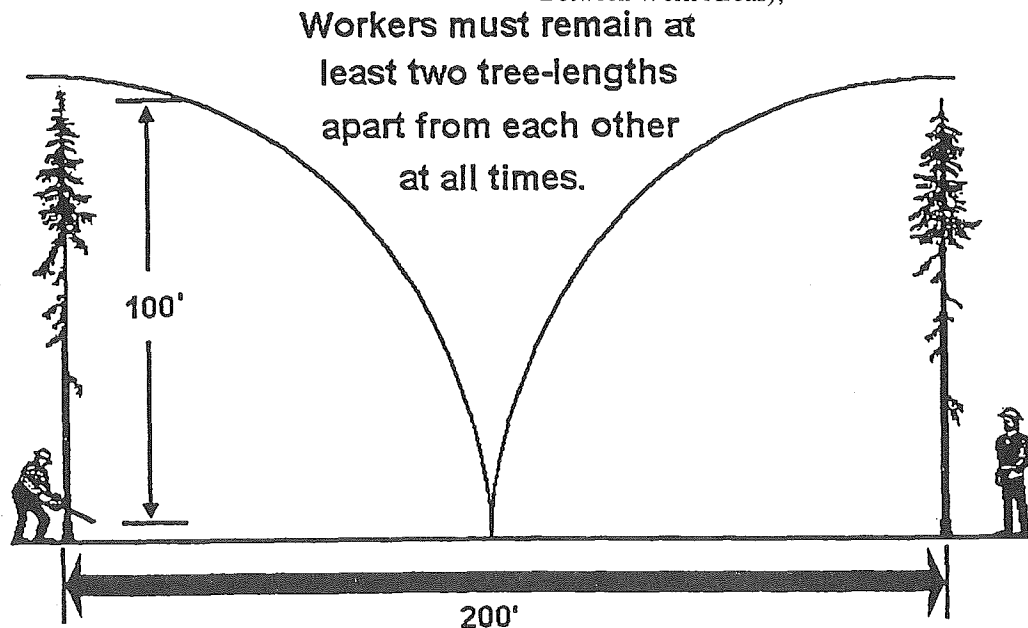
[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-537, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-537, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-537, filed 9/21/79.]

WAC 296-54-539 Falling and bucking—General. (1)

The employer must assign work areas so that:

(a) Trees cannot fall into an adjacent occupied work area;

(b) The distance between work areas is at least two tree lengths of the trees being fell (see Figure 1: Distance Between Work Areas);



(c) The distance between work areas reflects the degree of slope, the density of the growth, the height of the trees, the soil structure and other hazards reasonably anticipated at the worksite; and

(d) A distance of more than two tree lengths is maintained between work areas on any slope where rolling or sliding of trees or logs is reasonably foreseeable.

EXCEPTION: This rule does not apply to a team of cutters working on the same tree.

(2) Before falling or bucking, conditions such as, but not limited to, snow and ice accumulation, the wind, the lean of tree, dead limbs, and the location of other trees, must be evaluated by the cutter and precautions taken so a hazard is not created for an employee. Accumulations of snow and ice that may create a hazard for an employee must be removed before beginning falling in the area, or the area must be avoided.

(3) Employees must not approach a cutter closer than two tree lengths of trees being felled until the cutter has acknowledged that it is safe to do so.

(4) A competent person, properly experienced in this type of work, must be placed in charge of falling and bucking operations. Inexperienced workers must not be allowed to fall timber, buck logs or windfalls unless working under the direct supervision of an experienced cutter.

(5) Trees must not be fell if the falling tree can strike any line in the logging operation and endanger workers.

(6) Before an employee falls or bucks any tree:

(a) A sufficient work area must be swamped;

(b) The cutter must plan and clear an escape path; and

(i) The escape path must extend diagonally away from the expected felling line unless such an escape path poses a greater hazard than an alternate escape path; and

(ii) An escape path must be used as soon as the tree or snag is committed to fall, roll, or slide.

(7) If a cutter has determined a tree cannot be safely fell, the work must stop until the cutter has conferred with a supervisor or an experienced cutter and determined the safest possible work method or procedure.

(8) The person in charge of cutting crews must regularly inspect the work of the cutting crews and is responsible to ensure the work is performed in a proper and safe manner.

(9) All cutters must carry or have in near proximity at all times:

(a) An axe or suitable tool for driving wedges;

(b) A minimum of two wedges;

(c) A whistle carried on the person; and

(d) A first-aid kit.

(i) The first-aid kit must contain at least two trauma bandages or equivalent absorbent gauze material and a means to secure the material in place.

(ii) First aid supplies must be kept clean and dry.

(10) A flagperson(s) must be assigned on roads where hazardous conditions are created from falling trees. Where there is no through traffic, such as on a dead end road, warning signs or barricades may be used instead of a flagperson(s).

(11) A cutter must not fall a tree or danger tree alone when at least two cutters are necessary to minimize hazards.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-17-117, § 296-54-539, filed 8/18/99, effective 12/1/99. Statutory Authority:

[Title 296 WAC—p. 1214]

RCW 49.17.040, [49.17].050 and [49.17].060, 96-22-013, § 296-54-539, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW, 80-11-057 (Order 80-15), § 296-54-539, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240, 79-10-081 (Order 79-14), § 296-54-539, filed 9/21/79.]

WAC 296-54-53910 Falling and bucking—Falling.

(1) Where felled trees are likely to roll and endanger workers, cutting must proceed from the bottom toward the top of the slope, and uphill from previously fell timber.

(2) A cutter must not be placed on a hillside immediately below another cutter or below other logging operations where there is probable danger.

(3) Cutters must be informed of the movement and location of other employees placed, passing, or approaching the vicinity of trees being fell.

(4) Cutters must give audible warning when falling trees, and:

(a) Indicate the direction of fall;

(b) Ensure that all employees are out of reach of the tree; and

(c) Ensure that all employees are in clear of logs, fallen trees, snags, or other trees that may be struck by the falling tree.

EXCEPTION: Audible warnings are not required when falling trees less than 18 inches DBH, if the cutter has an unobstructed view of the entire area that could be affected by the tree being fell and is assured there is no one within the area.

(5) While manual falling is in progress, all logging machines must be operated at least two lengths away from trees being manually fell.

EXCEPTION: This provision does not apply to logging machines performing tree pulling operations or logging machines called upon by the cutter to ground hazard trees. All cutters must be notified of the logging machine's entrance into the area and all falling within two tree lengths of the logging machine must stop.

(6) Trees must be fell into the open whenever conditions permit.

(7) Cutters must not fall into another strip; trade leaners on the line.

(8) Knocking over trees larger than six inches in diameter in lieu of cutting is prohibited, except as provided in WAC 296-54-53910(9).

(9) Domino falling of trees, including danger trees, is prohibited. Domino falling does not include the falling of a single danger tree by falling another single tree into it.

(10) Undercuts large enough to safely guide trees and eliminate the possibility of splitting must be used on all trees over 6 inches DBH.

For example: A tree with no perceptible lean, having an undercut depth of one-fourth of the diameter of the tree and a face opening equal to one-fifth of the diameter of the tree would meet the requirement.

(11) A cutter must place an adequate undercut and leave enough holding wood to ensure the tree will fall in the intended direction.

(12) The two cuts that form the undercut must not cross where they meet, except where a dutchman is required on either side of the cut.

(13) The undercut must not be made while other workers are in an area into which the tree could fall.

(14) A backcut must be made in each tree being fell.

(a) The backcut must be as level as possible;

(b) The backcut must leave enough hinge wood to hold the tree to the stump during most of its fall so that the hinge is able to guide the tree's fall in the intended direction; and

(c) The backcut must be above the level of the horizontal facecut to provide an adequate platform to prevent kickback.

EXCEPTION: This requirement does not apply to open-faced falling where two angled facecuts are used instead of a horizontal facecut.

(d) In tree-pulling operations the backcut may be at or below the undercut hinge point.

(15) Cutting holding wood instead of using wedges is prohibited. Swing cuts are prohibited except by an experienced person.

(16) Trees with face cuts and/or backcuts must not be left standing unless all the following conditions are met:

(a) The cutter clearly marks the tree;

(b) Discontinues work in the hazardous area;

(c) Notifies all workers who might be endangered; and

(d) Takes appropriate measures to ensure that the tree is safely fell before other work is undertaken in the hazardous area.

(17) Undercuts and backcuts must be made at a height above the highest ground level to enable the cutter to safely begin the cut, control the tree, and have freedom of movement for a quick escape from a falling tree.

(18) Lodged trees must be clearly marked and identified by a predetermined method and all persons in the area must be instructed not to pass or work within two tree lengths of the trees except to ground them.

Note: See Figure No. 2, for illustrations of undercuts.

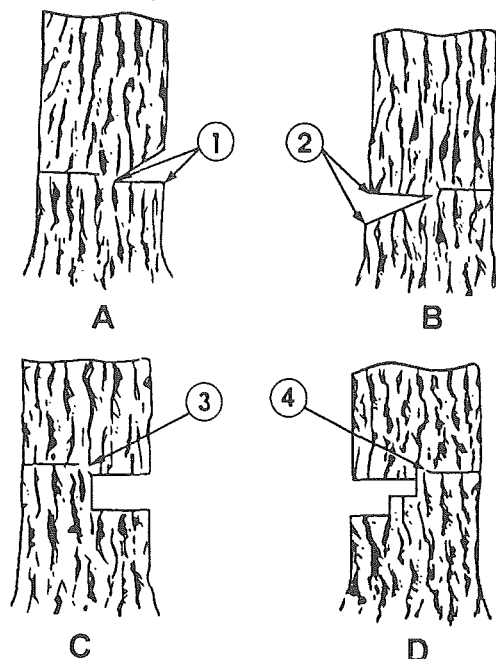


FIGURE 2: UNDERCUTS

- (A) **Conventional undercut.** Can be made with parallel saw cut and axe diagonal cut or both cuts with the saw. Generally used on trees of small diameter.
- (B) **Humboldt undercut.** Leaves square-end log. Same as (A), except that waste is put on the stump.
- (C) **Two parallel cuts with the saw.** The material between the cuts is chopped out with an axe-adz (pulaski) combination. Used on trees over 30 inches in diameter.
- (D) **Three parallel cuts with the saw, leaving a step.** Same in principle as (C). Used on trees of very large diameters.

Item

- 1 **Undercut depth**
- 2 **Undercut height**
- 3 **Holding wood**
- 4 **Backcut**

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-53910, filed 8/18/99, effective 12/1/99.]

WAC 296-54-53920 Falling and bucking—Bucking.

(1) The tree (and root wad if applicable) must be carefully examined to determine which way the logs (and root wad) will roll, drop, or swing when the cut is completed. No worker shall be allowed in this danger zone during cutting. The cut must be made from a position that will not expose the cutter to potential injury.

(2) Logs must be completely bucked through whenever possible. If it becomes hazardous to complete a cut, then the log must be marked and identified by a predetermined method. Rigging crews must be instructed to recognize such marks and when possible, cutters must warn the rigging crew of locations where unfinished cuts remain.

(3) Cutters must give timely warning to all persons within range of any log that may have a tendency to roll after being cut off.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-53920, filed 8/18/99, effective 12/1/99.]

WAC 296-54-53930 Falling and bucking—Danger trees.

(1) Each danger tree must be carefully checked for signs of loose bark, broken branches and limbs, or other damage before they are fell or removed. Accessible loose bark and other damage that may create a hazard for an employee must be removed or held in place before falling or removing the tree. When a danger tree has elevated loose bark that cannot be removed, the buddy system must be used to watch for and give warning of falling bark or other hazards.

(2) Danger trees that are unsafe to cut must be blown down with explosives or fell by other safe methods.

(3) To avoid use of wedges, which might dislodge loose bark or other material, danger trees must be fell in the direction of lean unless other means (mechanical or dynamite) are used.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-53930, filed 8/18/99, effective 12/1/99.]

WAC 296-54-53940 Falling and bucking—Springboards and tree jacking. (1) Springboards must be:

- (a) Made of clear, straight grained sound stock;
- (b) Long enough, wide enough, and strong enough; and

(c) Replaced when they will no longer safely support the expected load at the extreme end.

(2) Springboard irons must be well lipped and firmly attached with bolts or other equally strong attachment.

(3) Saw chains must be stopped while shifting springboards.

(4) Jack plates must be used with hydraulic tree jacks and the base plate must be seated on solid wood inside the bark ring as close to level as possible.

(5) When necessary, two workers must be present at the tree during hydraulic tree jacking to lend assistance.

(6) Wedges must be used as a follow-up method while using tree jacks, and continuously moved in as the tree is jacked.

(7) All hydraulic tree jacks must be equipped with a check valve and the pump must be equipped with an operable pressure gauge.

(8) Jacking a tree straight uphill is prohibited when the tree may slide back past the stump.

(9) On slopes over 50% grade, tree(s) must at least be quartered to a degree that prevents employees from being exposed to the possibility of sliding or rolling trees or logs.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-53940, filed 8/18/99, effective 12/1/99.]

WAC 296-54-541 Tree pulling. (1) The cutter must be responsible for determining if a tree can be safely pulled. If, for any reason, the cutter believes the tree pulling cannot be completed safely, the tree must be conventionally fell.

(2) When using a radio, positive radio communications must be maintained at all times between the tree pulling machine and cutter when tree pulling. An audible signal must be blown when the initial pull is made on the tree and the line is tightened. Hand signals, instead of radio communications and an audible signal, may be used only if the cutter is clearly visible to the tree puller operator.

(3) A choker with bell, or a line and sleeve shackle must be used as the means of attachment around the tree when tree pulling. (See also WAC 296-54-54710(4).) The bight on the line must be the minimum necessary to hold the choker or line around the tree.

(4) The tree pulling machine must be equipped with a torque converter, fluid coupler, or an equivalent device to ensure a steady even pull on the line attached around the tree.

(5) The tree pulling line must have as straight and direct path from the machine to the tree as possible. Physical obstructions that prevent a steady even pull on the tree pulling line must be removed or the line must be rerouted.

(6) Siwashing, in lieu of a block, in order to change tree pulling lead, is prohibited.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-541, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-541, filed 9/21/79.]

WAC 296-54-543 Mechanized falling. (1) A flagger(s) must be assigned on roads where hazardous conditions are created from falling trees. Where there is no through traffic, such as on a dead end road, warning signs or barricades may be used instead of a flagger(s).

[Title 296 WAC—p. 1216]

(2) Self-propelled mobile falling equipment used for falling trees must be designed, or have auxiliary equipment installed, that will cause the tree to fall in the intended direction.

(3) Until the machine operator has acknowledged that it is safe to do so, no employee shall approach a mechanical falling operation closer than a minimum of two tree lengths of the trees being fell.

(4) Mechanized falling must be conducted in a way that does not endanger people or equipment.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-543, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-543, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-543, filed 9/21/79.]

WAC 296-54-545 Climbing equipment and passline.

(1) Standard climbing equipment must be furnished by the employer. However, the climber may use personal equipment, if it meets the requirements of this section and is permitted by the employer.

(a) The climber may fasten climbing rope by passing it through "D" rings fastened to the belt and around his body before tying it to itself.

(b) An extra set of climbing equipment must be kept at the jobsite and another person with climbing experience must be present.

(2) The climber must be equipped with a climbing equipment assembly that includes:

(a) A safety belt with double "D" rings;

(b) Steel spurs long and sharp enough to hold in any tree in which they are used; and

(c) A climbing rope made of wire-core hemp, wire or chain construction.

(3) All climbing equipment must be maintained in good condition.

(4) Defective climbing equipment must be immediately removed from service.

(5) Going up a raised portable spar or tower without suitable equipment is prohibited.

(6) Only an employee directed by the climber may work directly under a tree. The climber must give warning before intentionally dropping any objects or when objects are accidentally dropped.

(7) Running lines must not be moved while the climber is working in the tree, except such "pulls" as climber directs and are necessary for the work.

(8) One experienced person must be assigned to transmit the climber's signals to the machine operator.

(a) This signal person must not otherwise be occupied while the climber is in the tree.

(b) The machine operator must not be distracted while the climber is using the passline.

(c) The designated signal person must be positioned clear of hazards from falling, flying, or thrown objects.

(9) The climber must be an experienced logger with proper knowledge of logging methods and the safety of rigging spar and tail trees.

(10) Noisy equipment such as power saws, tractors, and shovels must not be operated near where a climber is working when such noise will interfere with the climber's signals.

(11) Climbing and passline equipment must not be used for other purposes.

(12) Lineman hooks must not be used as spurs.

(13) Tools used by the climber, except the chain saw, must be safely secured to climber's belt when not in use.

(14) Using snaps on a climber's rope is prohibited unless a secondary safety device between the belt and snap is used.

(15) A climber's rope must encircle the tree before the climber leaves the ground, except when the climber is riding the passline.

(16) While the climber is working in the tree, persons must keep at sufficient distance from the tree to be clear of falling objects.

(17) When used, passline blocks must be kept in alignment and free from fouling.

(18) Loose equipment, rigging, or material must either be removed from the tree or securely fastened.

(19) Drums used for passlines must have enough flange depth to prevent the passline from running off the drum at any time.

(20) Passlines must:

(a) Be at least 5/16-inch and not over 1/2-inch in diameter;

(b) Not be subjected to sawing on other lines or rigging, and kept clear of all moving lines and rigging;

(c) Be one continuous length and in good condition with no splices, knots, molles, or eye-to-eye splices between the ends;

(d) Long enough to provide three wraps on the drum before the climber leaves the ground.

(21) Passline chains must be:

(a) At least 5/16-inch alloy or 3/8-inch high test chain and must not contain cold shuts or wire strands;

(b) Attached to the end of the passline with a screw-pin shackle, a slip-pin shackle with a nut and malle, or a ring large enough to prevent going through the pass block; and

(c) Fitted with links or rings to prevent workers from being pulled into the passline block.

(22) Pass blocks must:

(a) Be inspected before placing in each spar and the necessary replacements or repairs made before they are hung;

(b) Have the shells bolted under the sheaves;

(c) Have the bearing pin securely locked and nuts keyed, or the block positively secures the nut and pin;

(d) Be equipped with sheaves at least six inches in diameter; and

(e) Comply with WAC 296-54-54750.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-545, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-545, filed 9/21/79.]

WAC 296-54-547 Rigging—General. (1) Rigging must be arranged and operated so that rigging and loads will not foul or saw against lines, straps, blocks, or other equipment or material.

(2001 Ed.)

(2) When not in use, rigging must be stored so that it does not present a hazard to employees.

(3) Tongs, grapples, logs and materials must not be swung or suspended over employees.

(4) All employees must be in the clear of running lines, standing skylines, moving rigging, or suspended loads until the rigging or loads have completely stopped.

(5) Riding on a turn of logs or rigging is prohibited, except on the passline. Holding on to moving rigging or chokers to be pulled uphill is prohibited.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-547, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-547, filed 9/21/79.]

WAC 296-54-54710 Rigging—Inspection. (1) An authorized, qualified person must thoroughly inspect all blocks, straps, guylines, butt rigging, and other rigging before they are used.

(2) The inspections must include examining for:

(a) Damaged, cracked, or worn parts;

(b) Loose nuts and bolts;

(c) Need for lubrication; and

(d) The condition of straps and guylines.

(3) All necessary repairs or replacements for safe operation must be made before the rigging is used.

(4) All rigging elements must be large and strong enough to safely withstand the stress that can be imposed by the maximum pull of the power unit against the equipment or devices as rigged or used in that particular logging operation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-54710, filed 8/18/99, effective 12/1/99.]

WAC 296-54-54720 Rigging—Molles. (1) Molles must not be used as a temporary connection between two spliced eyes of a load-supporting running line. Double molles may be used on droplines only and single molles may be used on strawline.

(2) Molles must be as large as the pinhole will accommodate and have the loose ends rolled in.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-54720, filed 8/18/99, effective 12/1/99.]

WAC 296-54-54730 Rigging—Shackles. (1) Shackles used to hang blocks, jacks, or rigging on spars, must have the pins secured with a nut and cotter key or a nut and malle.

(2) Flush pin, straight-sided shackles must be used for mainline, slackline and skyline extensions.

(3) Shackles with screw pins, knockout or slip pins may be used to anchor skylines, slackline, guyline, and/or guyline extensions.

(4) All other shackles must be screw pin type or have the pin secured with a nut and cotter key or a nut and malle, except as specified elsewhere for specific purposes.

(5) The opening between the jaws of shackles used to hang blocks, jacks, and rigging and to join or attach lines, must be a maximum of one inch greater than the size of the rope, swivel, or shackle to which it is attached.

[Title 296 WAC—p. 1217]

(6) All shackles must be one size larger than the lines they connect and made of forged steel or material of equivalent strength.

(7) Shackles used to join lines must be hung with the pin and "U" part of the shackle through the eyes of the lines.

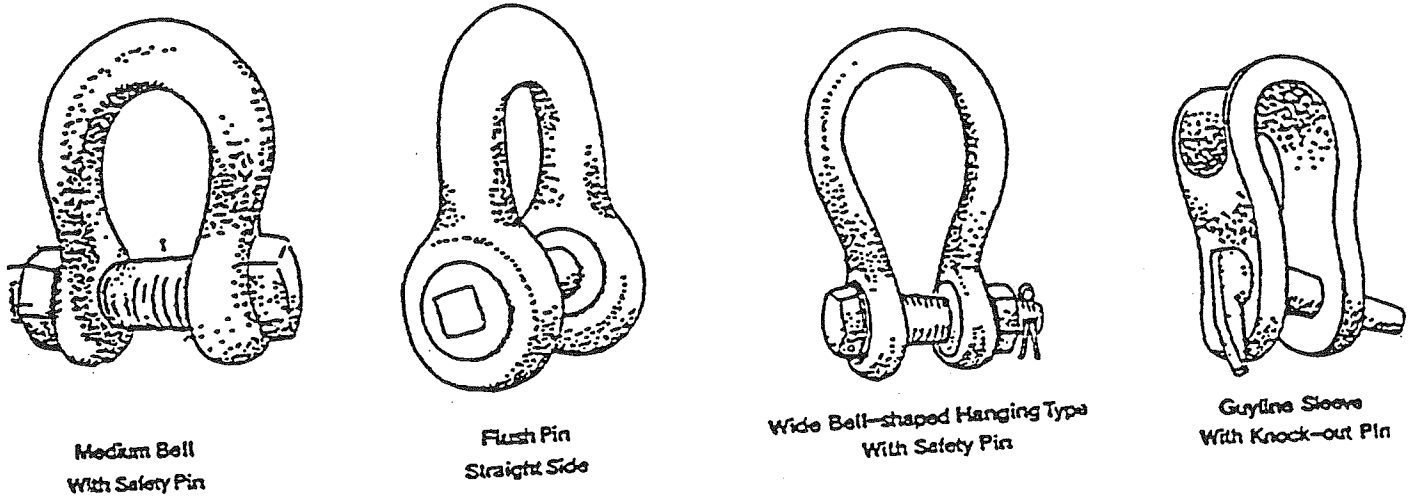


Figure 2-2: Shackles

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-54730, filed 8/18/99, effective 12/1/99.]

WAC 296-54-54740 Rigging—Straps. Straps must be used according to the following requirements:

(1) Straps or chokers used to hang corner or tail blocks and straps used to anchor skylines/slacklines must be the size required by Table 1: Strap/Choker Size in Inches.

Running Line Size in Inches	Block or Skyline / Slackline Hung in Both Eyes	Block Hung in Single Eye
5/16	1/4	1/2
3/8	3/8	9/16
7/16	7/16	5/8
1/2	1/2	3/4
9/16	9/16	7/8
5/8	5/8	1
3/4	3/4	1 1/8
7/8	7/8	1 1/4
1	1	1 3/8
1 1/8	1	
1 1/4	1	
1 3/8	1	
1 1/2	1 1/8	
1 5/8	1 1/4	
1 3/4	1 1/4	
1 7/8	1 3/8	
2	1 3/8	

Note: Both strap ends must be under equal tension.

(2) When a single choker or single part strap is used to support lift blocks, jacks and tree shoes they must be adequately sized to support the applied loads.

(3) When a two part strap or two chokers are used to hang a block, jack, tree shoe, or rigging, both eyes or ends must be under equal tension.

(4) Where two equal length chokers are used instead of one choker to gain extra breaking strength, they must be arranged in a swede connection.

(5) Straps or chokers used to hang or support blocks, jacks, tree shoes, or rigging must be replaced when there is evidence of damaged or broken wires. They must:

- (a) Be made of new wire rope; or
- (b) Meet the pull test strength of new wire rope.
- (6) Threading wire rope straps eye through eye is prohibited.

(7) Synthetic straps must be used as recommended by the manufacturer and only at a flat or downward angle unless wrapped one full turn around the tree support to prevent the strap from riding up on the support.

(8) Synthetic straps must be removed from service when wear reaches the limits prescribed by the manufacturer or when deterioration is evident.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-54740, filed 8/18/99, effective 12/1/99.]

WAC 296-54-54750 Rigging—Blocks. (1) Load-bearing blocks must:

- (a) Not be used for heavier strains or lines than those for which they are constructed;
- (b) Be fitted with line guards;
- (c) Be designed and used to prevent fouling;
- (d) Be kept in proper alignment when in use;
- (e) Be equipped with bearing and yoke pins that will safely withstand the strains imposed, and are securely fastened; and
- (f) Be equipped with sheaves designed for the size of the wire rope used.

EXCEPTION: Subsections (b), and (f) do not apply to rig-up ("Tommy Moore") blocks.

(2) Blocks with cracked or excessively worn sheaves or shells must not be used.

(3) Block bearings must be kept well lubricated.

(4) All pins in blocks must be properly secured by "Molle Hogans" or keys of the largest size the pin hole will accommodate. When blocks are hung in spars, pins must be secured with a nut and cotter pin or nut and molle.

(5) Lead blocks used for yarding, swinging, loading and unloading used in wood spars shall:

(a) Be of the type and construction designed for this purpose;

(b) Be bolted with not less than two bolts through the shells below the sheaves in a manner that will retain the sheave and line in case of bearing pin failure (this does not apply to haulback lead blocks); and

(c) Mainline blocks shall have a sheave diameter of not less than twenty times the diameter of the mainline.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-54750, filed 8/18/99, effective 12/1/99.]

WAC 296-54-54760 Rigging—Hanging blocks. (1) All logging systems must use enough corner or tail blocks to distribute the stress on anchors and attachments.

(2) Blocks (other than passline or haywire) must be hung by one of the following methods:

(a) Hanging the block in both eyes or Ds of the straps (threaded straps are prohibited); or

(b) If chokers are used, the ferrule must be properly seated in the socket of the bell or hook to prevent the ferrule from coming unbuttoned. The chokers must be the size required in WAC 296-54-54740(1); or

(c) If single part straps are used, the straps must be secured with a shackle and be the size required in WAC 296-54-54740(1).

(3) The yoke pin of haulback blocks shall be inserted with the head facing the direction from which the rigging approaches.

(4) When there is danger of tail block straps slipping up or off the stump or tree, the stump or tree must be adequately notched or the line properly wrapped and secured. When the tail tree or stump is not secure, it must be tied back.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-54760, filed 8/18/99, effective 12/1/99.]

WAC 296-54-54770 Chokers and butt rigging. (1) Chokers must be at least one size smaller than the mainline. If a dropline is used it must have a breaking strength equal to a line one size smaller than the mainline.

(2) All butt hook rigging must be used in a manner to prevent loss of the choker.

(3) Molles or cold shuts are prohibited in butt rigging as a load bearing connection.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, amended and recodified as § 296-54-54770, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-559, filed 10/28/96, effective 1/1/97. Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-54-559, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 81-05-013 (Order 81-3), § 296-54-559, filed 2/10/81. Statutory Authority: RCW

(2001 Ed.)

49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-559, filed 9/21/79.]

WAC 296-54-549 Selecting spar, tail and intermediate support trees. (1) Spar, tail and intermediate support trees must be examined carefully for defects before being selected. They must be sound, straight, green and of sufficient diameter to withstand the strains to be imposed.

(2) Trees having defects that impair their strength must not be used for spar, tail or intermediate support trees. Raised trees must be identified and marked as such.

(3) Douglas fir or spruce must be used as spar trees when available. If other species must be used, additional guylines, tree plates or other precautions must be taken to ensure that the tree will withstand the strains to be imposed.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-549, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-549, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-549, filed 9/21/79.]

WAC 296-54-551 Raising and lowering portable spars or towers. (1) A qualified, authorized person must direct each raising and lowering of a portable spar or tower.

(2) All employees not engaged in the raising or lowering of portable spars must stay in the clear during these operations.

(3) Portable spars must be leveled to provide proper line spooling and avoid excessive stress on component parts.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-551, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-551, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-551, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-551, filed 9/21/79.]

WAC 296-54-553 Metal spars. (1) Each portable metal spar must have an identification plate permanently attached to its base or on the yarder in a position that can be easily read by a person standing on the ground or on the base platform.

EXCEPTION: A hydraulic loader with yarding drums is not required to have an identification plate if the drums are installed and used according to the manufacturer's recommendations.

(2) The identification plate must have the following information:

(a) Name and address of manufacturer;

(b) Model number; and

(c) The maximum and minimum angle at which the metal spar is designed to operate.

(3) The identification plate on metal spars manufactured after July 1, 1980, must also have the following information:

(a) The maximum breaking strength and/or size of the mainline for which the spar is designed;

(b) The maximum breaking strength and/or size of the haulback line for which the spar is designed;

(c) The number, breaking strength, and size of guylines or any other lines required; and

(d) For a spar designed for a skyline, slackline, or modified slackline system, the maximum breaking strength and

size of the skyline, mainline, and haulback line that can be used.

(4) All portable metal spars must be operated within the manufacturer's capacity:

- (a) As specified on the identification plate; or
- (b) As modified by the manufacturer; or
- (c) As designed and specified by a registered engineer;

or

(d) A tension limiting device must be installed on the yarder. The device must be:

- (i) Designed to automatically slack the skyline or mainline to within the manufacturer's line strength specifications;
- (ii) Tamper proof;
- (iii) Inspected; and
- (iv) Maintained in good operating condition; or
- (e) A line fuse installed in the skyline or mainline. Line fused systems must have a design breaking strength equal to or less than the maximum line rating of the spar as listed on its identification plate.

Note: Item (d) and (e) list options to follow when using wire rope which exceeds the manufacturer's line strength specifications.

(5) Equipment used for yarding, which is specifically designed to be self-stabilizing during operation, may be used without guylines provided the equipment is used with guylines when required by the manufacturer.

(6) Portable spars or towers and their parts must be inspected by a qualified person whenever:

- (a) The portable spar or tower is lowered;
- (b) Its safe condition is in doubt; or
- (c) When damage from over-stress or any other source is noted or suspected. Before being used again, the part in question must be inspected by a suitable method and:
 - (i) Found safe;
 - (ii) Repaired by a qualified person; or
 - (iii) Replaced.

(7) Any structural modifications or additions that affect the capacity or safe operation of metal spars must be made under the direction of the manufacturer or a registered professional engineer. If such modifications or additions are made, the identification plate required in this section must reflect such changes.

(8) When moving metal spar logging machines, the spar must be lowered.

EXCEPTION: The spar may be raised when necessary for mobility if it is adequately supported to ensure the stability of the machine during movement.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-553, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-553, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-553, filed 9/21/79.]

WAC 296-54-555 Metal spar guylines safety straps.

(1) A metal spar guylines safety strap or equivalent device must be installed at the bight of the guylines to prevent guylines from falling vertically more than five feet in case of structural or mechanical failure of the guylines attachment.

(2) The safety strap or equivalent devices must be equal to the strength of one guylines being used.

[Title 296 WAC—p. 1220]

(3) Using cable clips or clamps to join the ends of portable spar or tower guylines safety straps is prohibited, unless used to secure the end of a farmer's eye.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-553, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-553, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-553, filed 8/20/80. Statutory Authority: RCW 49.17.040 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-553, filed 9/21/79.]

WAC 296-54-557 Wire rope. (1) Wire rope must be of the same or better grade as originally recommended by the equipment manufacturer.

(2) Wire rope must be removed from service when any of the following conditions exist:

(a) In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay;

(b) Wear of one-third the original diameter of outside individual wires. Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure;

(c) Evidence of any heat damage from any cause;

(d) Reductions from nominal diameter of more than 3/64-inch for diameters to and including 3/4-inch, 1/16-inch for diameters 7/8-inch to 1-1/8-inch, inclusive, 3/32-inch for diameters 1-1/4-inches to 1-1/2-inches inclusive;

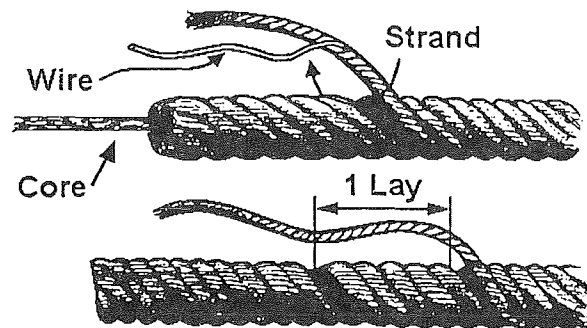
(e) In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection;

(f) In standing ropes, when twelve and one-half percent of the wires are broken within a distance of one wrap (lay); and

(g) Corroded, damaged, or improperly applied end connections.

(3) Wire rope must be kept lubricated as conditions of use require.

EXCEPTION: This section does not apply to chokers.



Wire rope selection is an important element in cable logging.

WIRE ROPE

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-557, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-557, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-557, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-557, filed 9/21/79.]

(2001 Ed.)

WAC 296-54-55710 Wire rope—Cutting. (1) Hard hammers must not be used for cutting cable with a wire ax or when splicing.

(2) Employees must wear eye protection when cutting lines.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-55710, filed 8/18/99, effective 12/1/99.]

WAC 296-54-55720 Wire rope—Splicing. (1) Marlin spikes must be used for splicing. The marlin spikes must be:

(a) Large enough for the size of the line being spliced; and

(b) Maintained in good condition;

(2) Short splices, eye-to-eye splices, cat's paws, and knots are prohibited except for moving nonload-bearing lines. Knots may be used on single drum tractors, grapple pickup lines, and dropline carriage systems using slider bells if the knot is tied on the end of the dropline.

(3) Wire rope one-half inch in diameter or less must be tucked at least two times provided the rope is used only as a strawline.

(4) Eye splices in all regular lay lines and straps must be tucked at least three times.

(5) Eye splices in lang lay lines must be tucked at least four times.

(6) Splices, other than eye splices, in lang lay loading lines are prohibited.

(7) Long splices must be used to permanently join regular lay running line.

(8) The length of line strand to be unraveled to make a long splice in wire rope must be as shown in Table 2: Length of Line Strand. The full length of the splice is twice the length of the rope to be unraveled.

Table 2: Length of Line Strand

Rope Diameter	To Be Unraveled	Total Length
1/4"	8'	16'
3/8"	8'	16'
1/2"	10'	20'
5/8"	13'	26'
3/4"	15'	30'
7/8"	18'	36'
1"	20'	40'
1-1/8"	23'	46'
1-1/4"	25'	50'
1-3/8"	28'	56'
1-1/2"	30'	60'
1-5/8"	33'	66'
1-3/4"	35'	70'
1-7/8"	38'	76'
2"	40'	80'

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-55720, filed 8/18/99, effective 12/1/99.]

WAC 296-54-55730 Wire rope—Attaching end fastenings. (1) The manufacturer's recommendations must be followed when attaching sockets and other end fastenings.

(2001 Ed.)

(2) Using cable clips or clamps for joining lines is prohibited, except to transfer slack lines from one place to another.

(3) When U-bolt cable clips are used to form eyes, Table 3: U-bolt Cable Clips to Form Eyes must be used to determine the number and spacing of clips.

Table 3: U-bolt Cable Clips to Form Eyes

Improved Plow Steel Diameter of Rope	Number of Clips Forged	Required Other Material	Minimum Space Between Clips
3/8 to 5/8 inch	3	4	-3/4 inch
3/4 inch	4	5	4-1/2 inch
7/8 inch	4	5	5-1/4 inch
1 inch	5	6	6 inches
1-1/8 inch	6	6	6-3/4 inch
1-1/4 inch	6	7	7-1/2 inch
1-3/8 inch	7	7	8-1/4 inch
1-1/2 inch	7	8	9 inches

(4) When U-bolt cable clips are used:

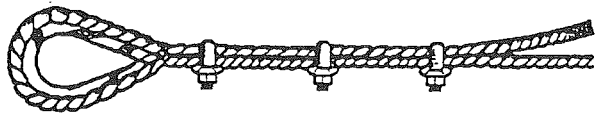
(a) For eye splices, the U-bolt wire rope clip must be attached so that the U section is in contact with the dead or short end of the rope (see Figure 3: Eyes Formed with U-bolt Cable Clips);

(b) U-bolt cable clips must be spaced at least six rope diameters apart to obtain the maximum holding power. Nuts must be tightened evenly and tightened again after application of the first sustained load. After the rope has been used and is under tension, the clips must be tightened again to take up any looseness caused by the tension reducing the rope diameter;

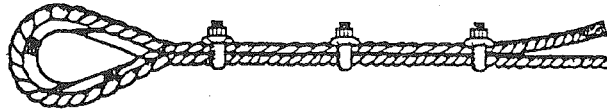
(c) With high strength wire rope, one more U-bolt cable clip must be added for each grade above improved plow steel; and

(d) Eyes formed with U-bolt cable clips are prohibited with running lines or straps.

**APPLICATION OF WIRE ROPE
U-BOLT CLIPS
Crosby Type**



1. CORRECT METHOD – U-Bolts of clips on short end of rope. (No distortion on live end of rope)



2. WRONG METHOD – U-Bolts on live end of rope. (This will cause mashed spots on live end of rope)



3. WRONG METHOD – Staggered clips; two correct and one wrong. (This will cause a mashed spot in live end of rope due to wrong position of center clip)

4. After rope is in service, and is under tension, tighten clips to take up decrease in rope diameter.

Figure 3: Eyes Formed with U-bolt Cable Clips

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-17-117, § 296-54-55730, filed 8/18/99, effective 12/1/99.]

WAC 296-54-561 Guylines. (1) Guylines must be used with any logging equipment when required by the equipment manufacturer.

(2) At least the minimum number and angle of guylines recommended by the equipment manufacturer must be used.

(3) Unless otherwise specified by the equipment manufacturer, guylines must be of the following sizes:

(a) In highlead logging, the head spar guylines must be equal in breaking strength to the mainline.

(b) In skyline logging, if the skyline is one and three-eighths inch or greater, the head spar guylines must be at least one and three-eighths inch. If the skyline is less than one and three-eighths inch, the head spar guylines must be equal in breaking strength to the skyline.

(c) On all other cable logging machines, the guylines must have a breaking strength at least equal to the mainline/skyline, whichever is largest.

(d) Tail/lift and intermediate support trees must be adequately guyed to withstand any stress to which the tree may be subjected.

(4) When guylines are required for spars they must be positioned according to Table 4: Guyline Positioning, or according to the manufacturer's specifications.

Table 4: Guyline Positioning

Number of Guys on Spar	Number of Guys Sharing Load	Positioning Figure Number
1	1	4 - 1 Guyline Case
2	2	5 - 2 Guyline Case
3	3*	6 - 3 Guyline Case
	2	7 - 3 Guyline Case (2)
4	2	8 - 4 Guyline Case
5	2	9 - 5 Guyline Case
	3	10 - 5 Guyline Case (2)
6	2	11 - 6 Guyline Case
	3	12 - 6 Guyline Case (2)
7	3	13 - 7 Guyline Case
8	2	14 - 8 Guyline Case
	4	15 - 8 Guyline Case (2)

*For metal spars designed to operate without snap guy

(5)(a) Guylines supporting metal spars must be made of plow steel or better material and must be maintained in good condition.

(b) Guylines for tail/lift and intermediate support trees may be made of synthetic material and must be used according to the manufacturer's recommendations.

(6) Load bearing guyline angles must be no greater than fifty degrees measured horizontally (See Figure 18: Maximum Angle for Load Bearing Guylines and Skyline). If suitable anchors are unavailable or the terrain is so steep that the guyline angle exceeds fifty degrees, an additional guyline must be rigged to oppose the load.

(7) Guylines must be kept securely tightened while the spar, tree, equipment or rigging they support is in use.

(8) Power driven devices must be securely anchored when used to tighten guylines. Holding such devices is prohibited.

(9) All trees that interfere with proper alignment, placement, or tightening of guylines must be fell.

(10) Guylines must be hung in a manner to prevent an excessive bight or fouling when they are tightened.

(11) The use of loops or molles for attaching guylines is prohibited.

(12) The U part of shackles or sleeves must be around the guyline and the pin passed through the eye of the guyline.

(13) Splicing of guylines is prohibited except to make an eye splice.

(14) All spliced guyline eyes must be tucked at least three times.

(15) Extensions to guylines must be:

(a) Equal in breaking strength to the guyline to which they are attached; and

(b) Connected only by a shackle connecting two spliced eyes, pressed eyes or by double-end hooks. Connections must have at least one and one-half times the strength of the guyline.

(16) When hanging a block or jack on a guyline, only sleeve-type safety pin shackles must be used. The shackle sleeve shall have not less than two and one-half times the line diameter bearing on the guyline.

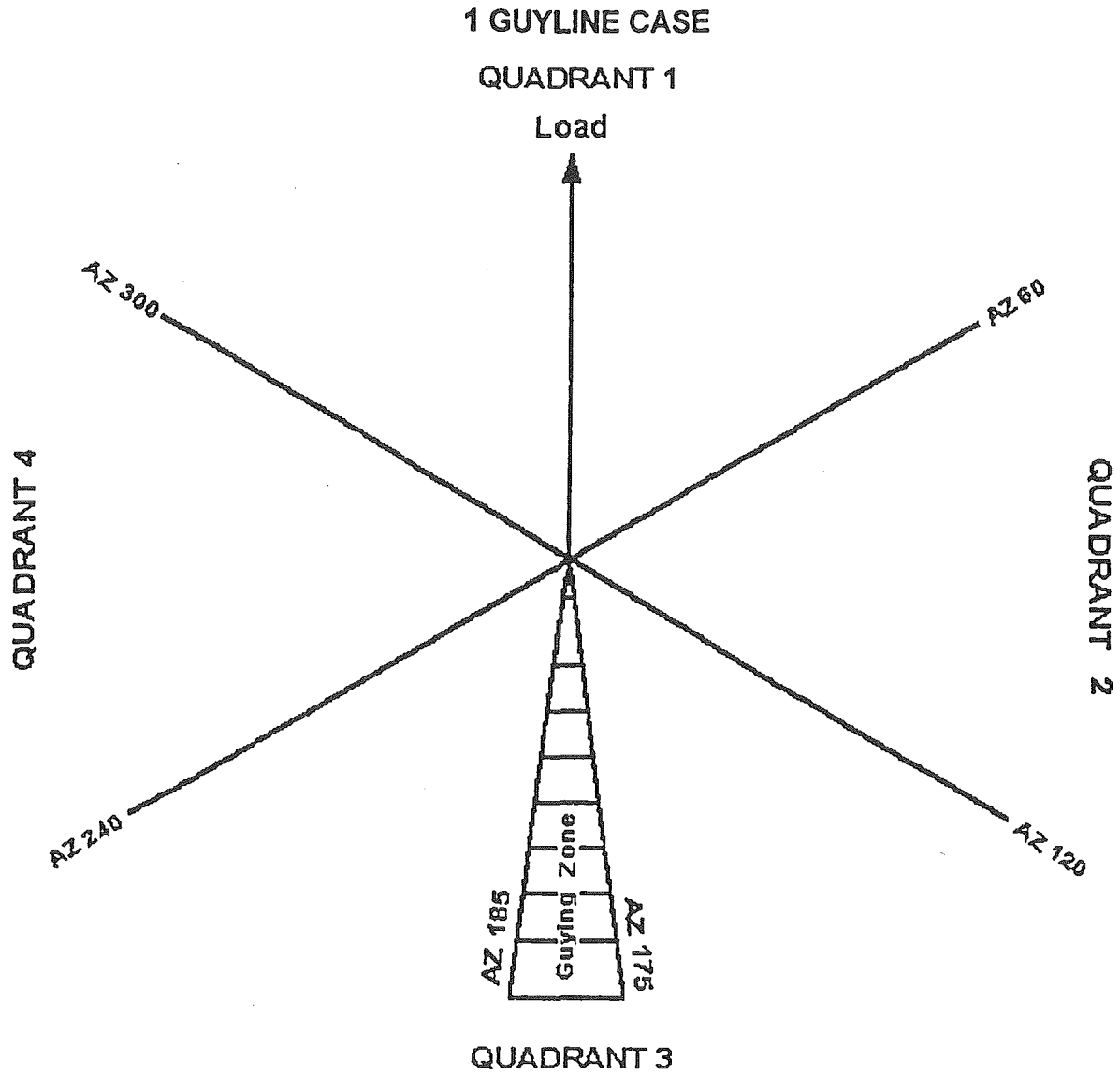


Figure 4: 1 Guyline Case

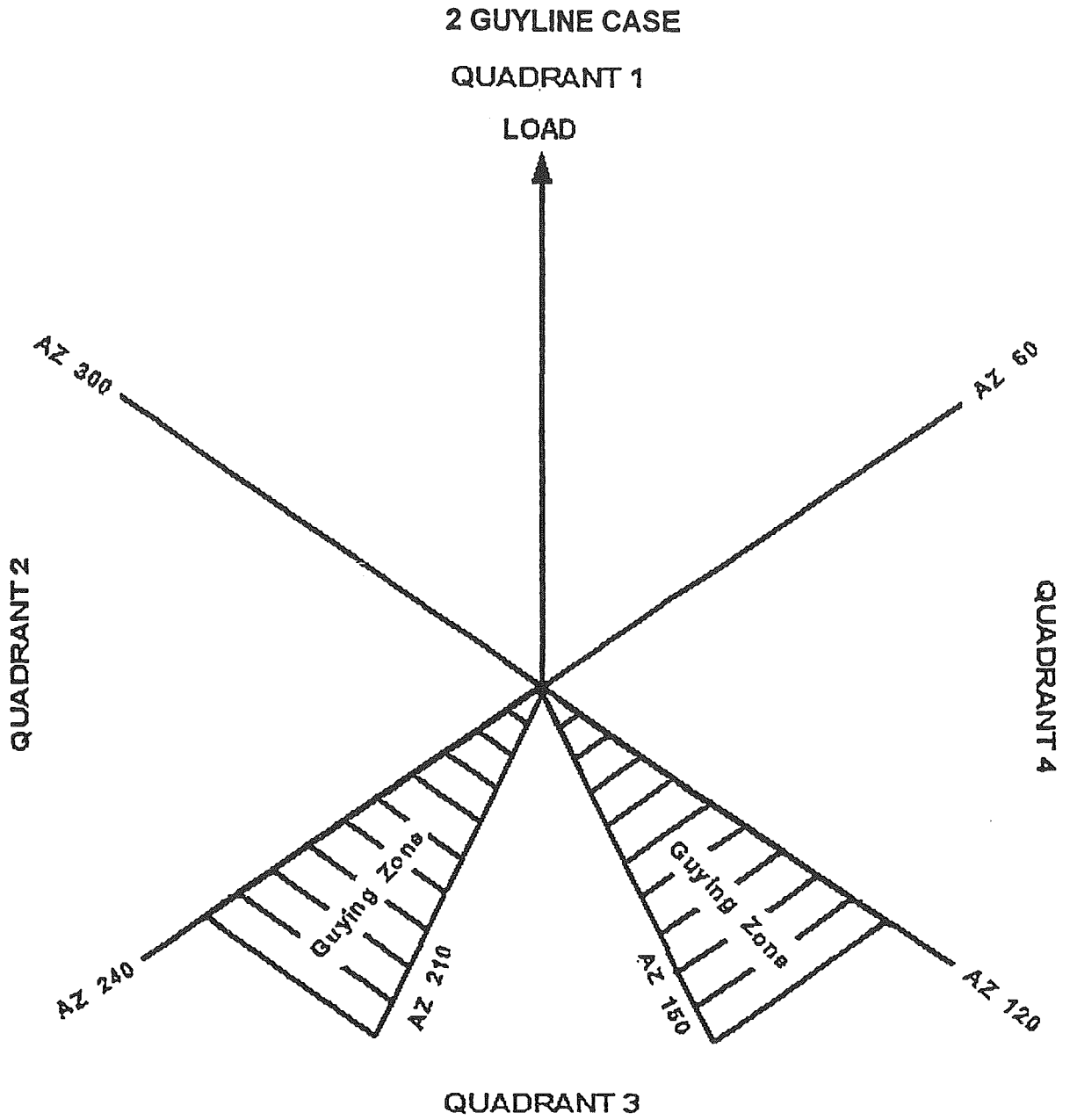


Figure 5: 2 Guyline Case

3 GUYLINE CASE

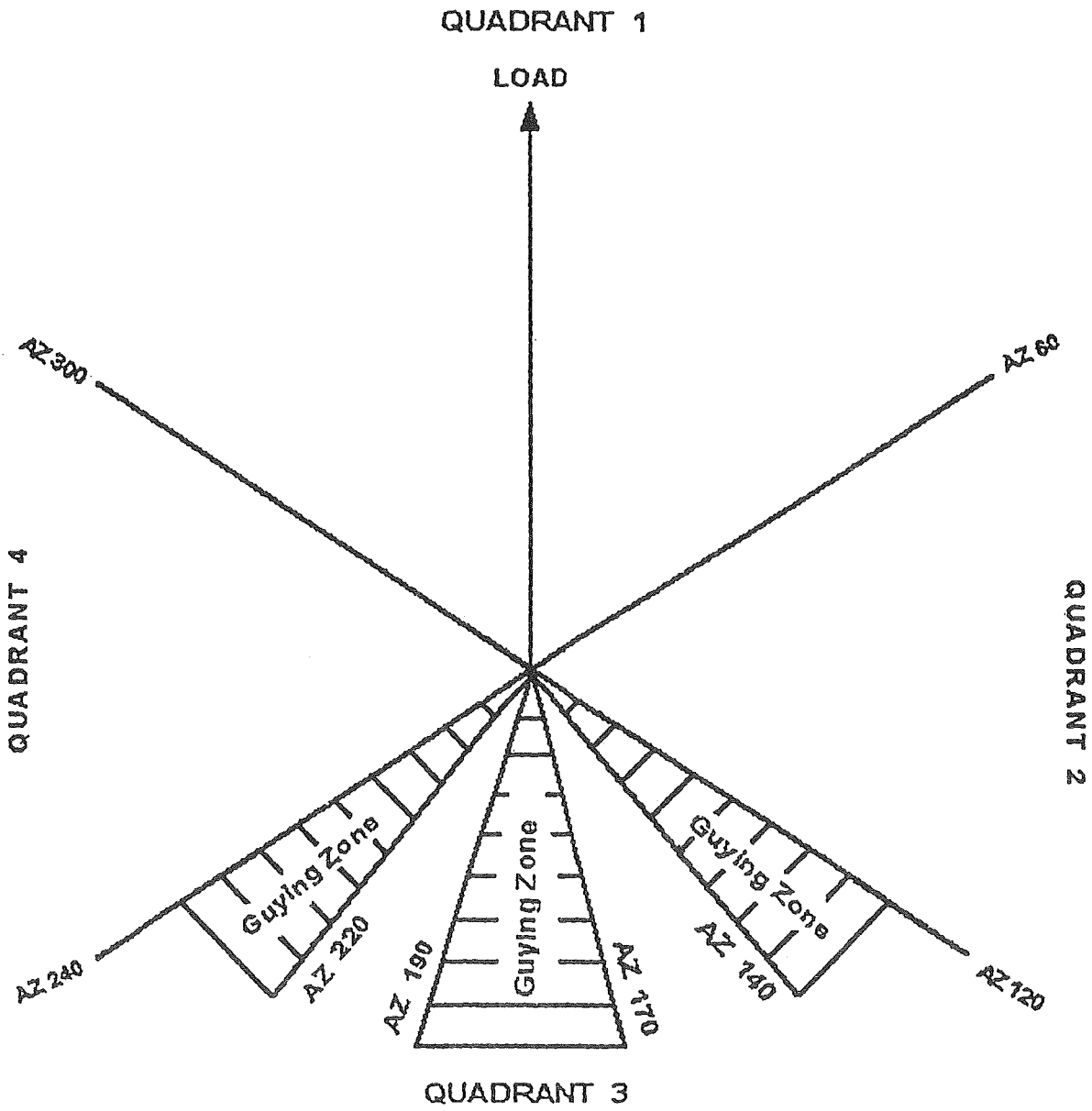


Figure 6: 3 Guyline Case

3 GUYLINE CASE

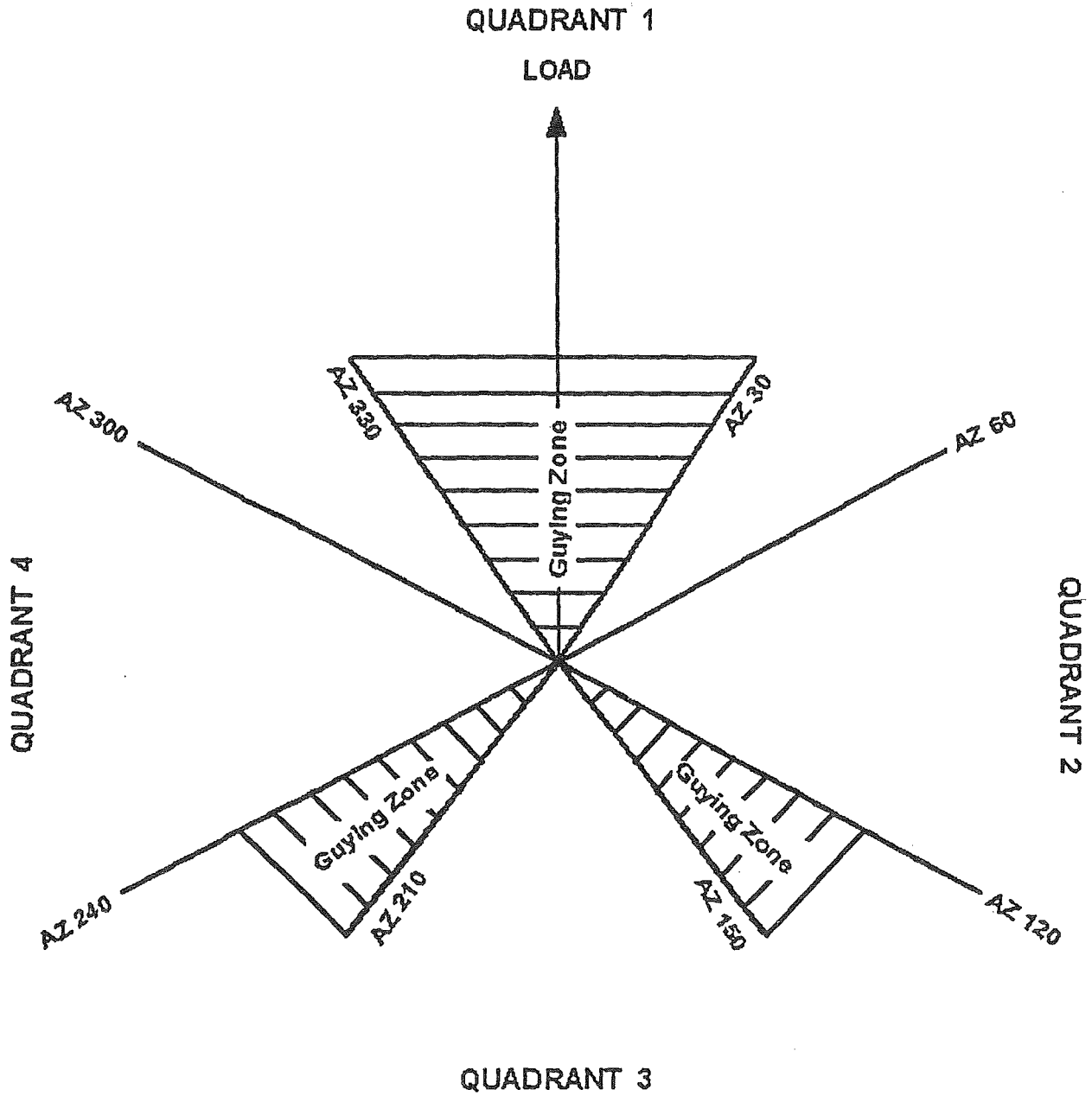


Figure 7: 3 Guyline Case (2)

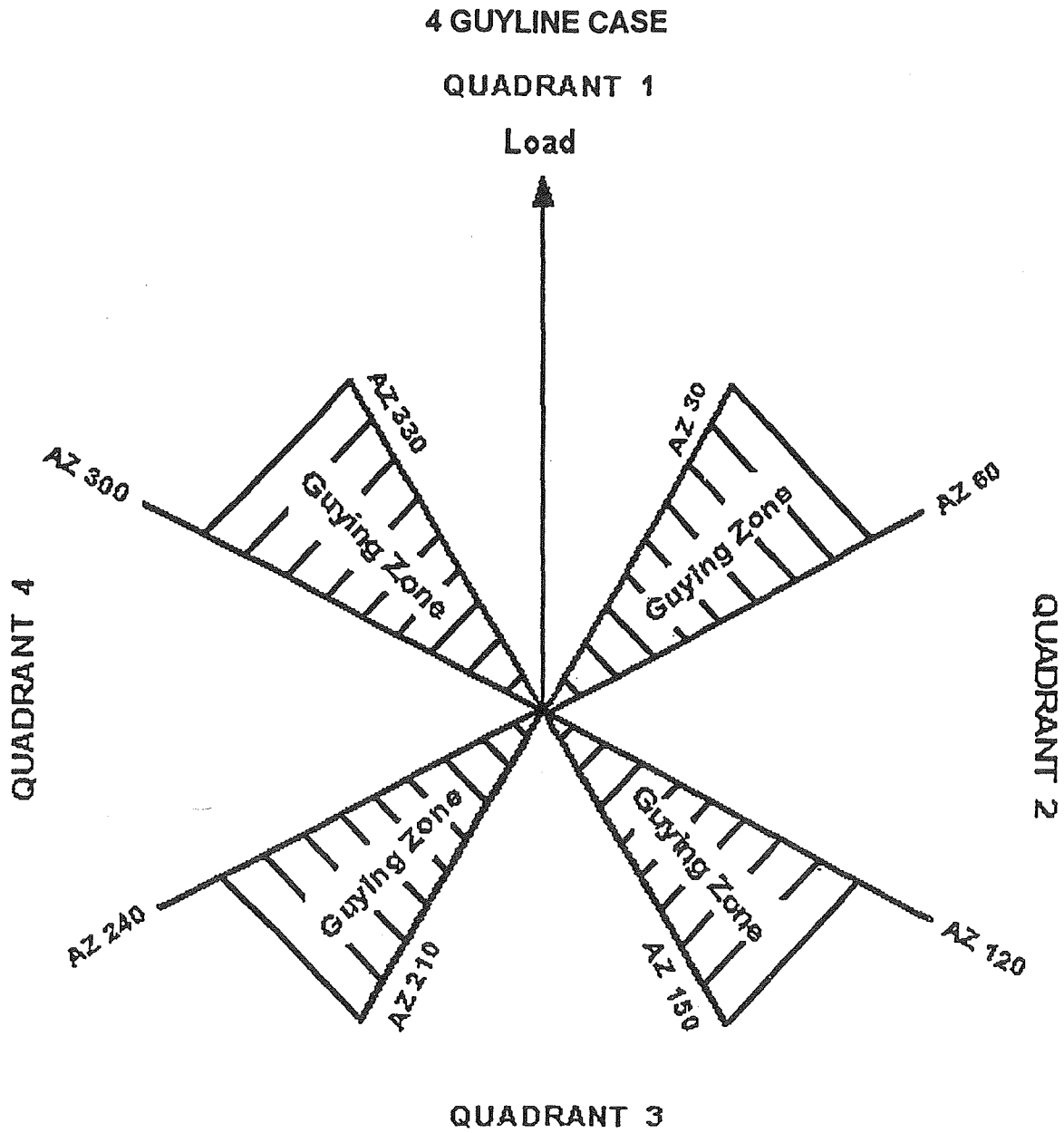


Figure 8: 4 Guyline Case

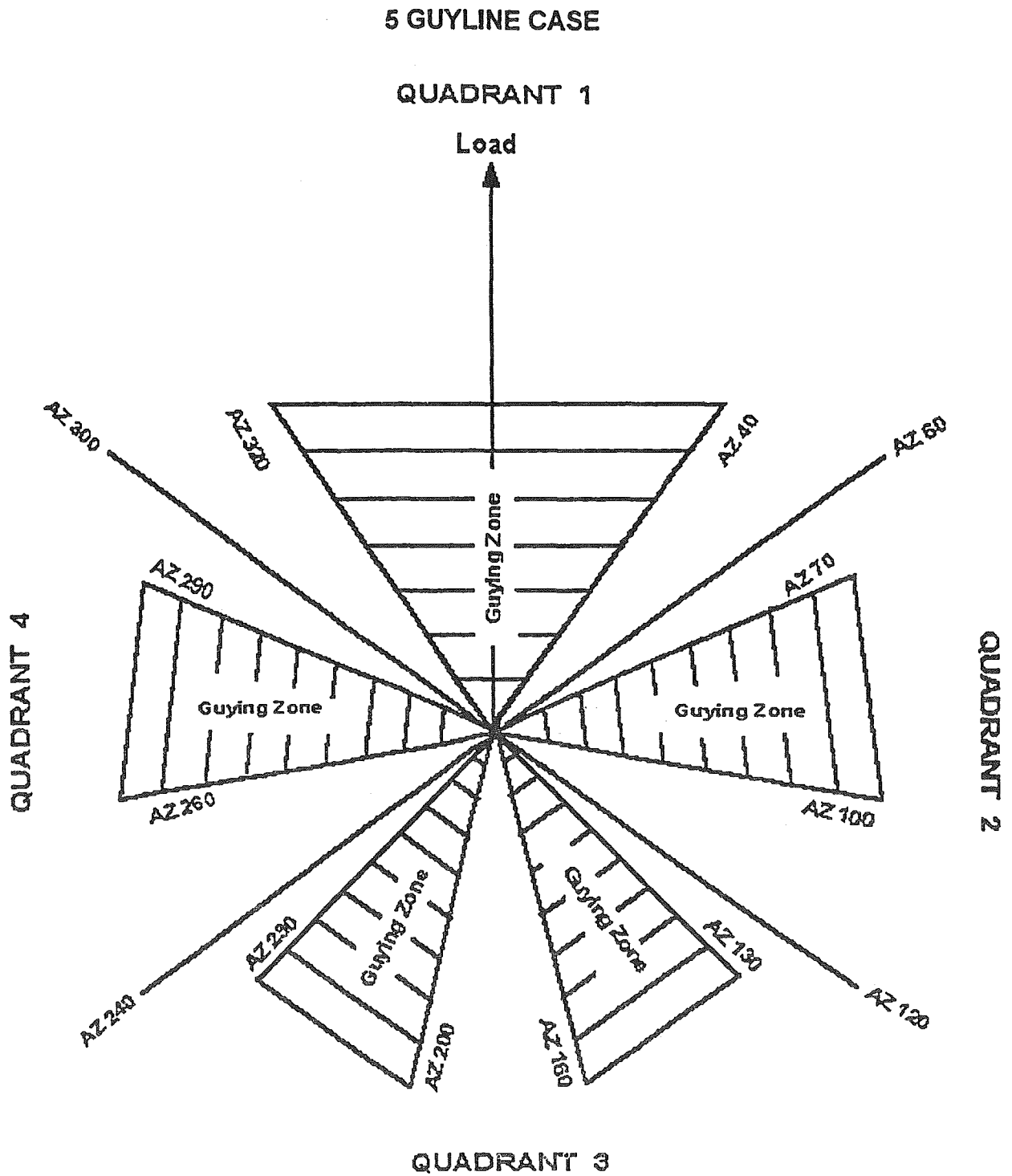


Figure 9: 5 Guyline Case

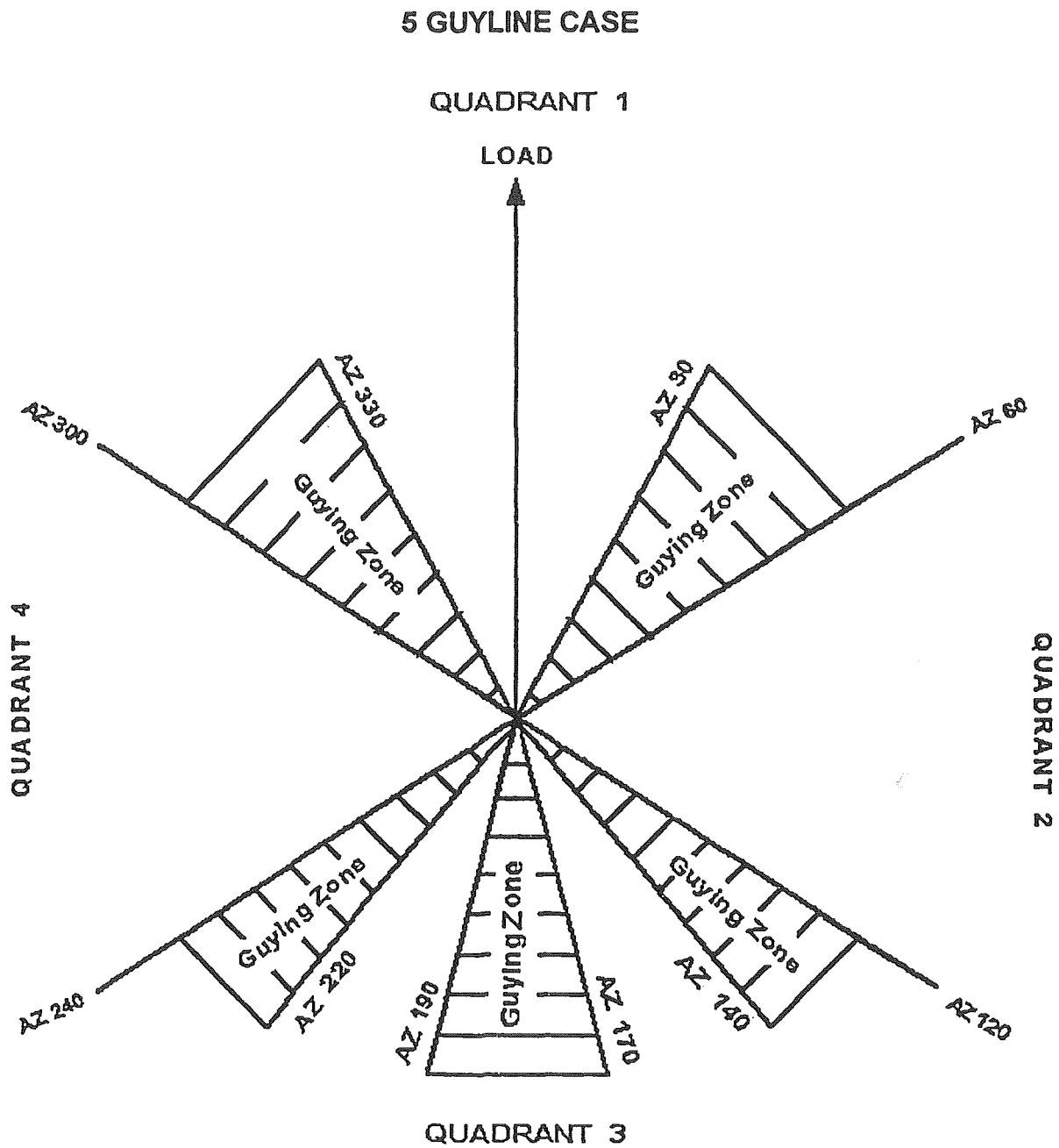


Figure 10: 5 Guyline Case (2)

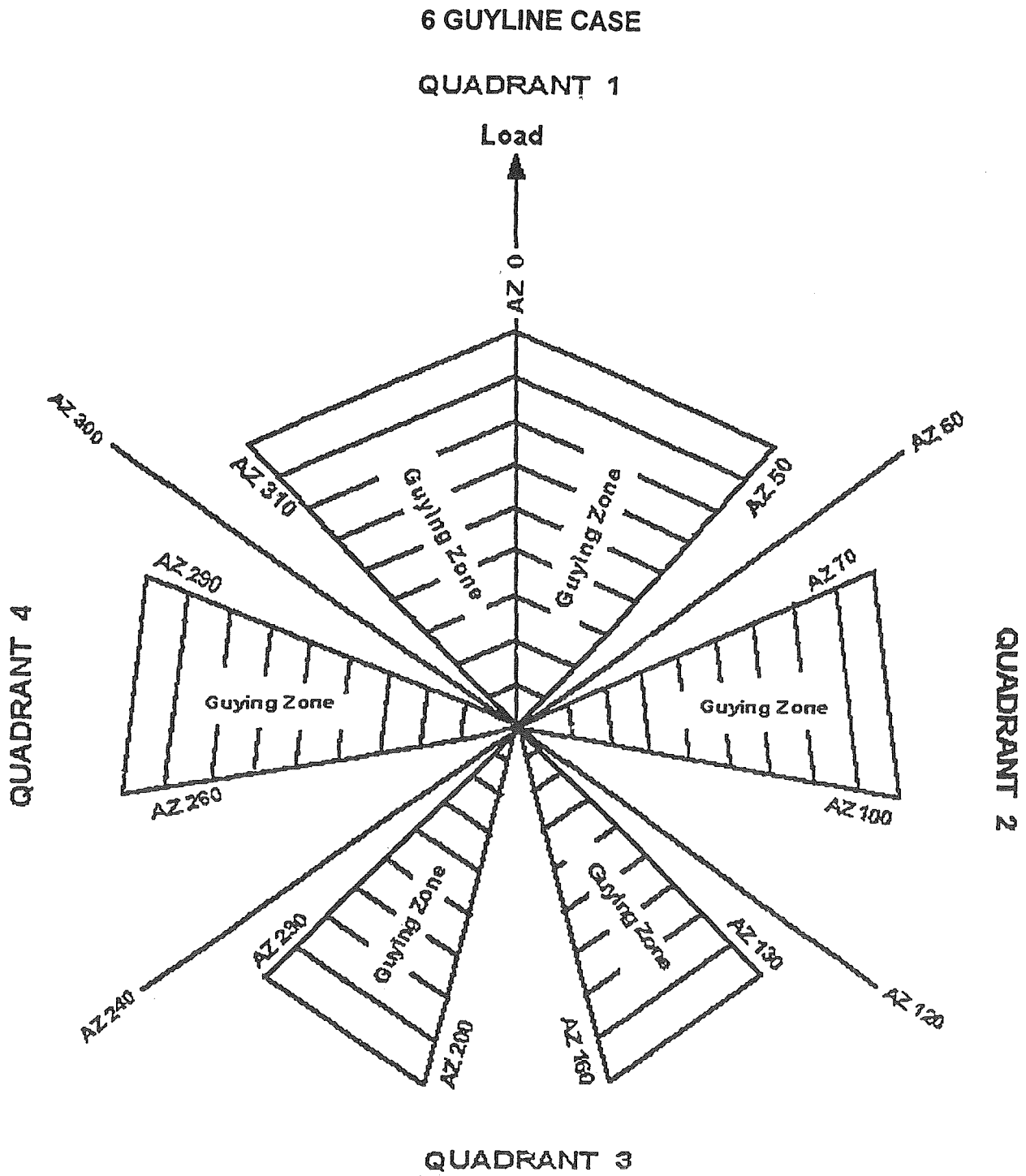


Figure 11: 6 Guyline Case

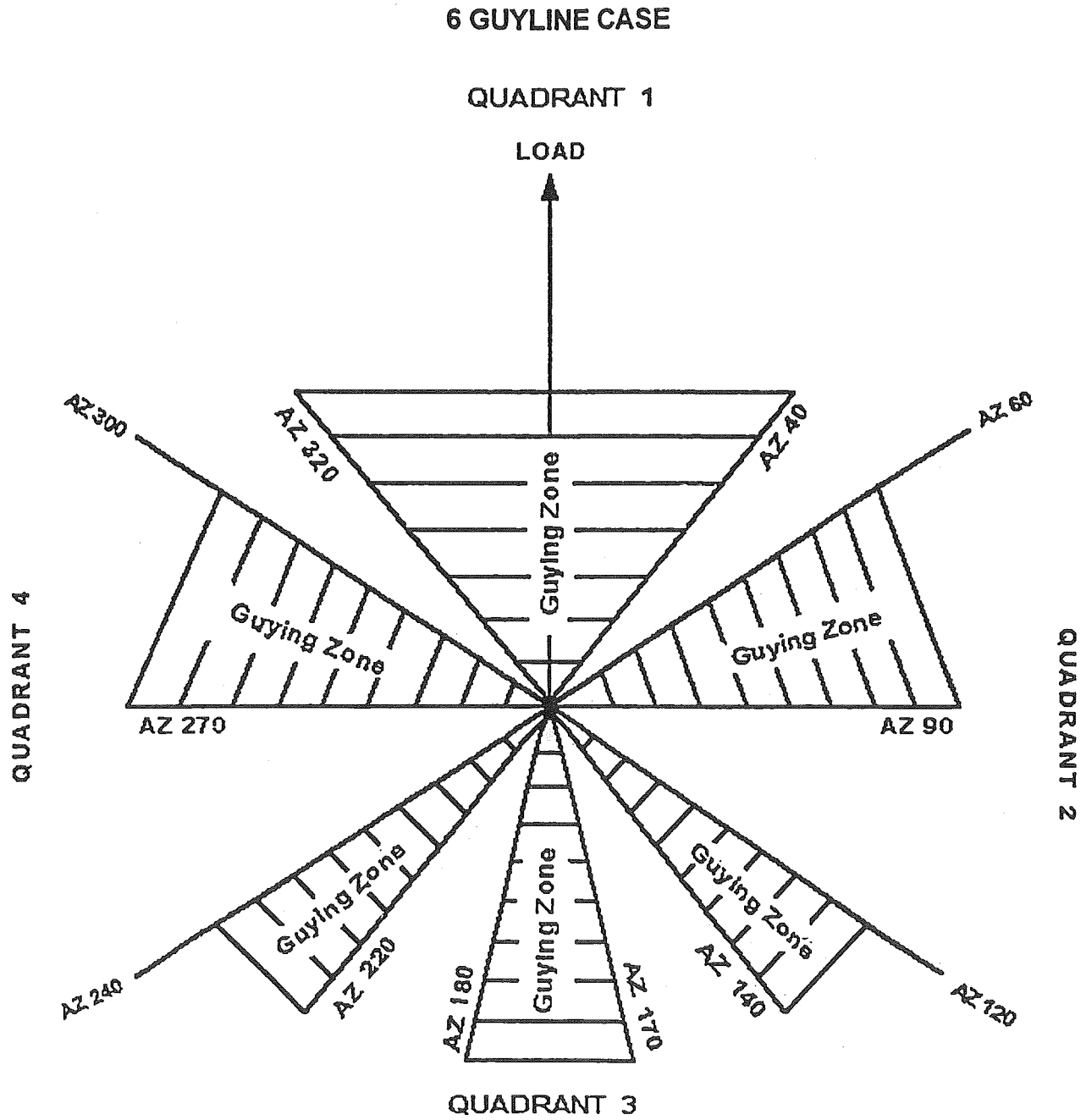


Figure 12: 6 Guyline Case (2)

7 GUYLINE CASE

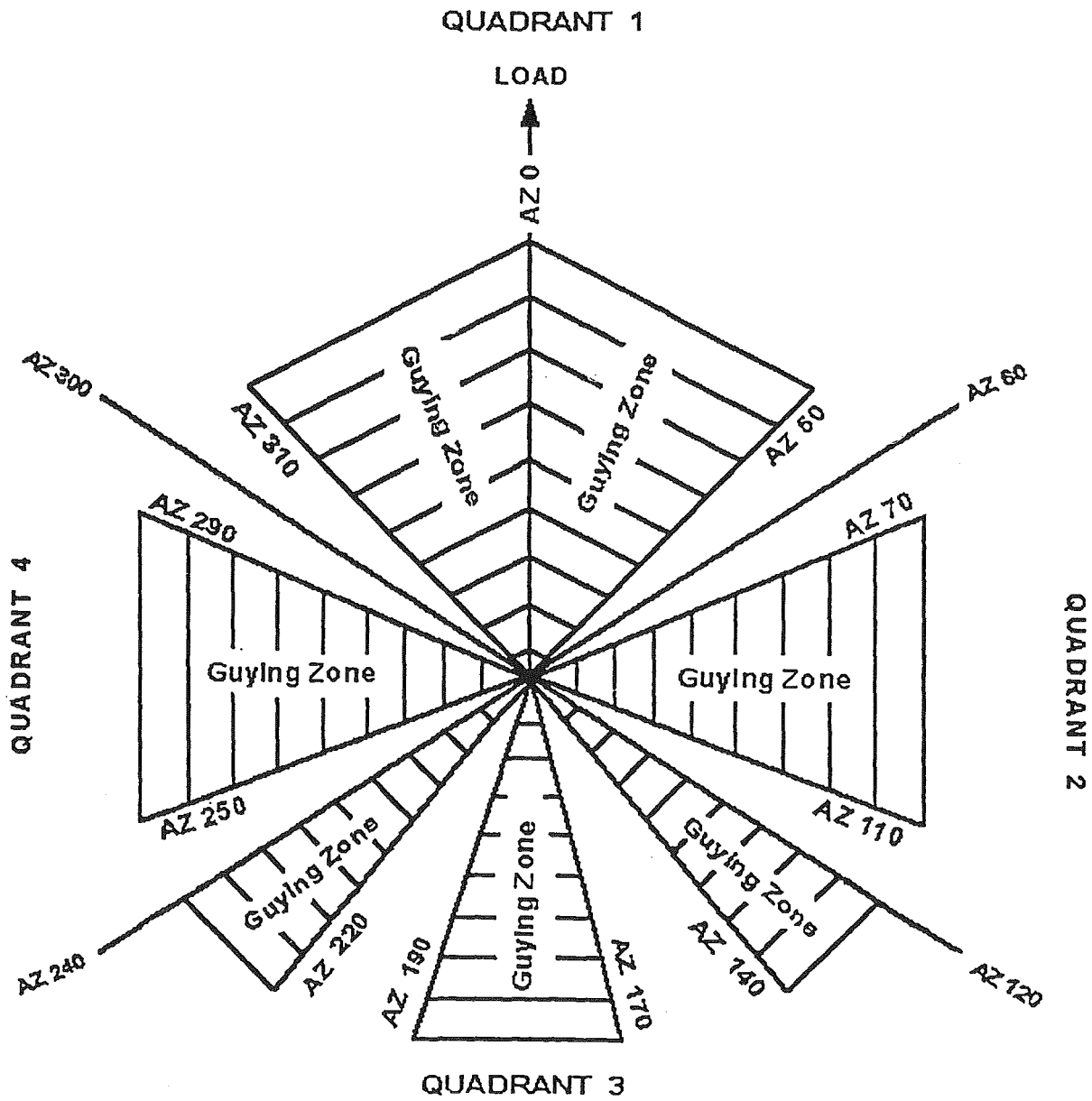


Figure 13: 7 Guyline Case

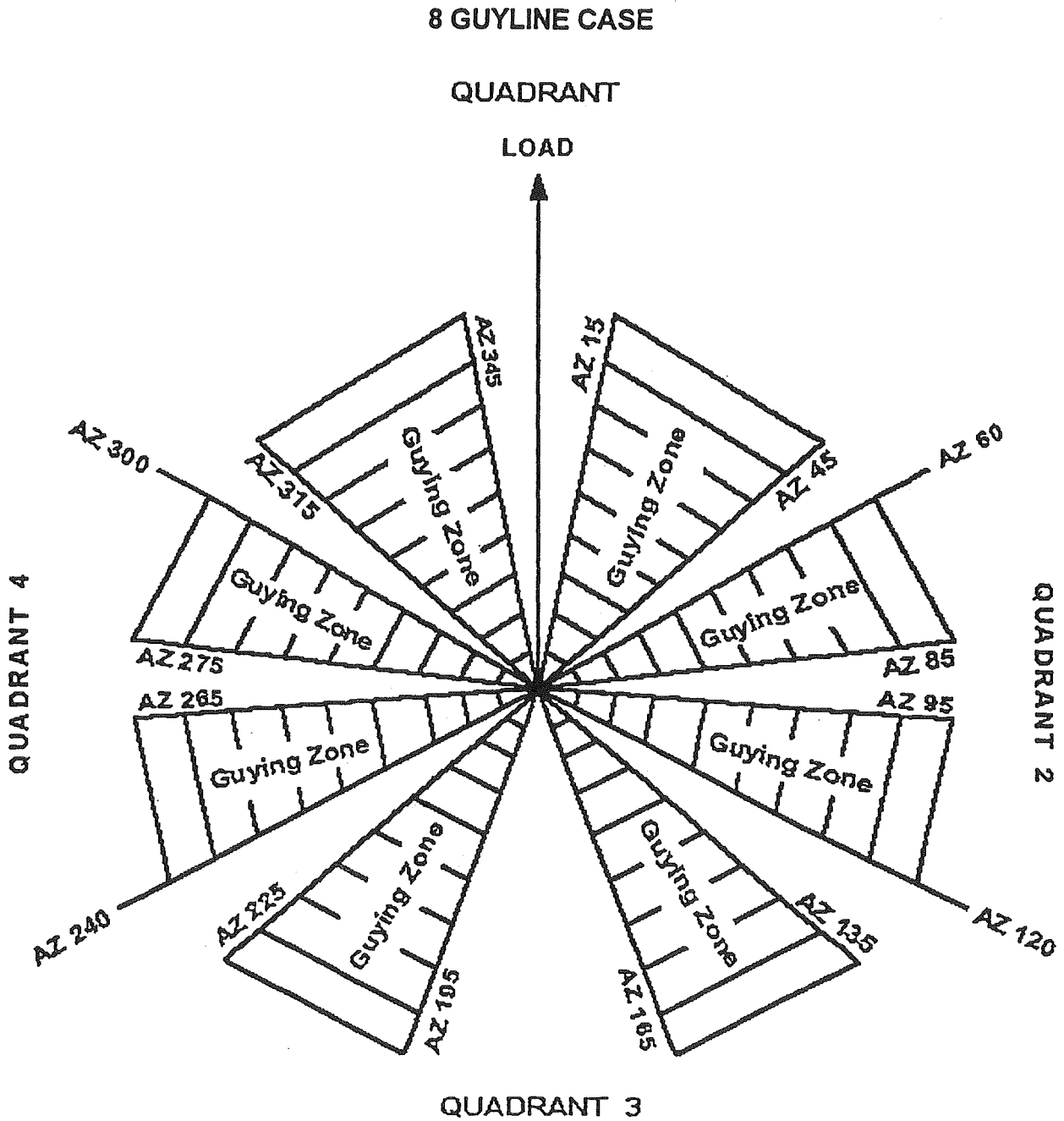


Figure 14: 8 Guyline Case

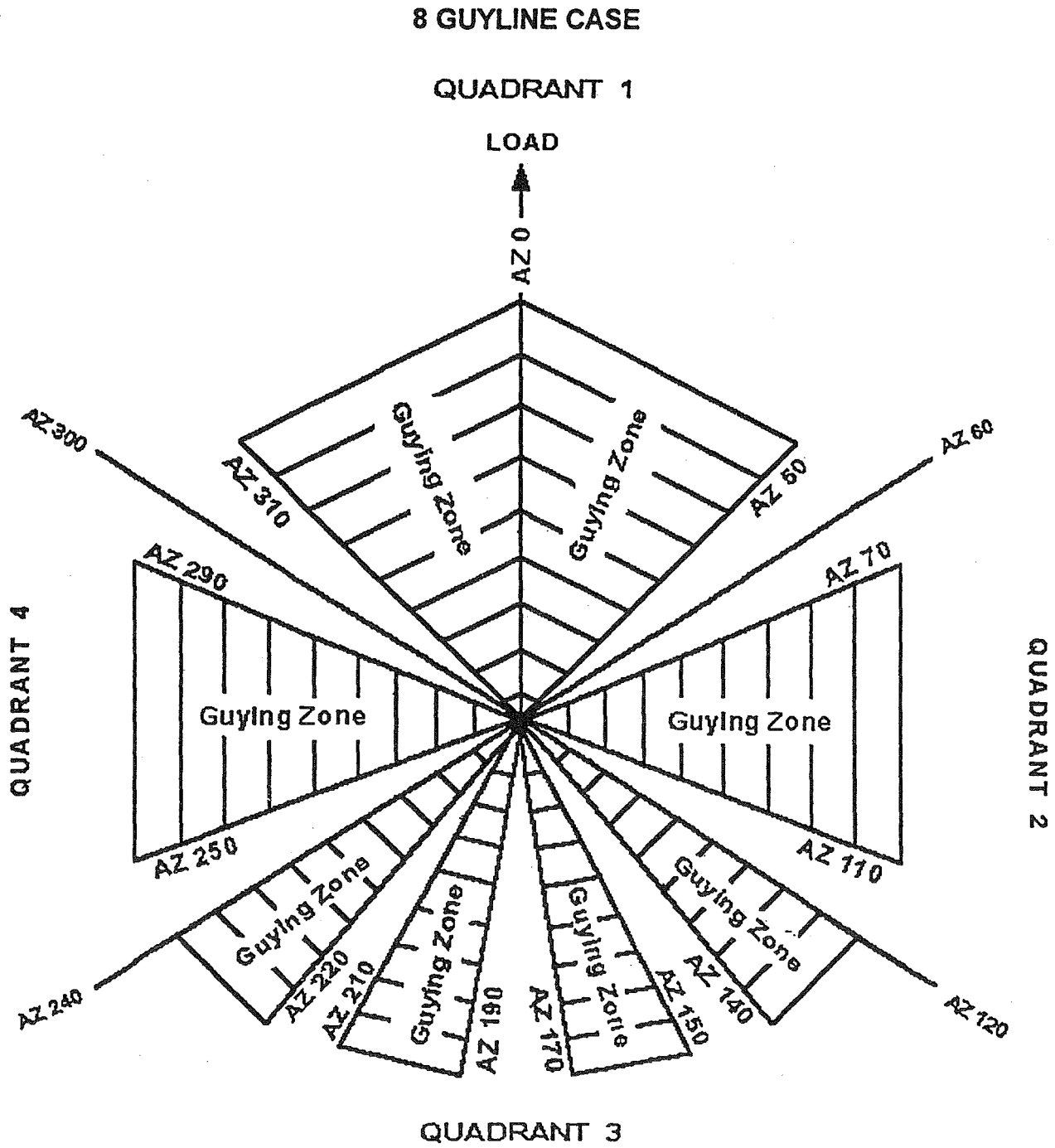


Figure 15: 8 Guyline Case (2)

POSITIONING GUYLINES IN BACK OF TREE

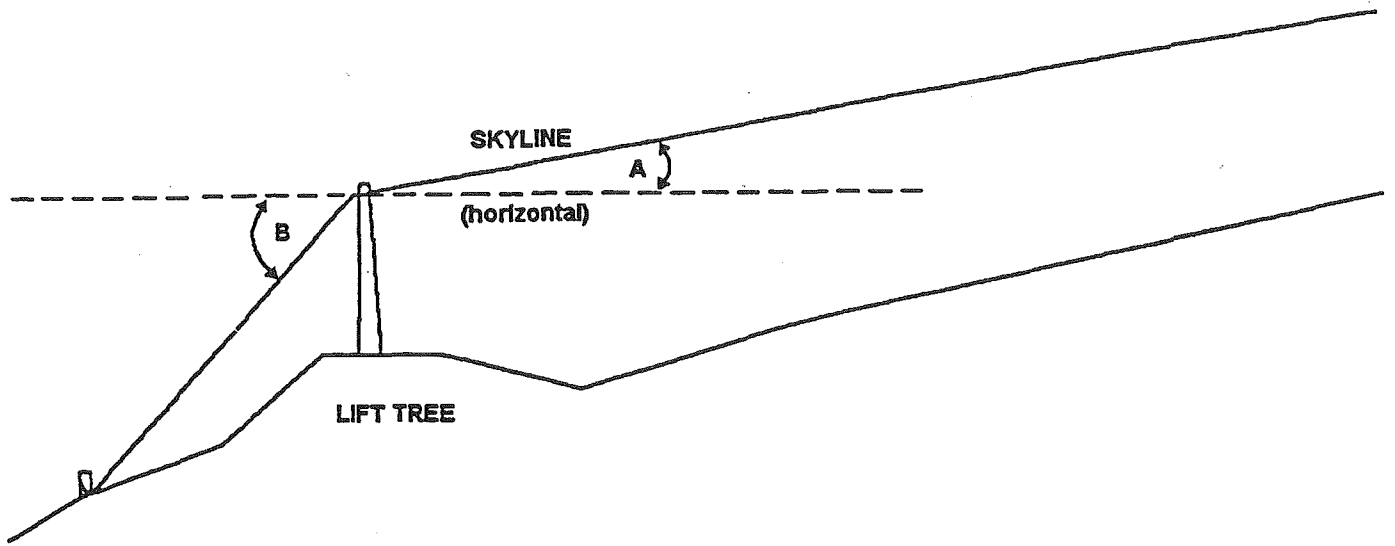


Figure 16: Positioning Guylines in Back of Tree

POSITIONING GUYLINES IN FRONT OF TREE

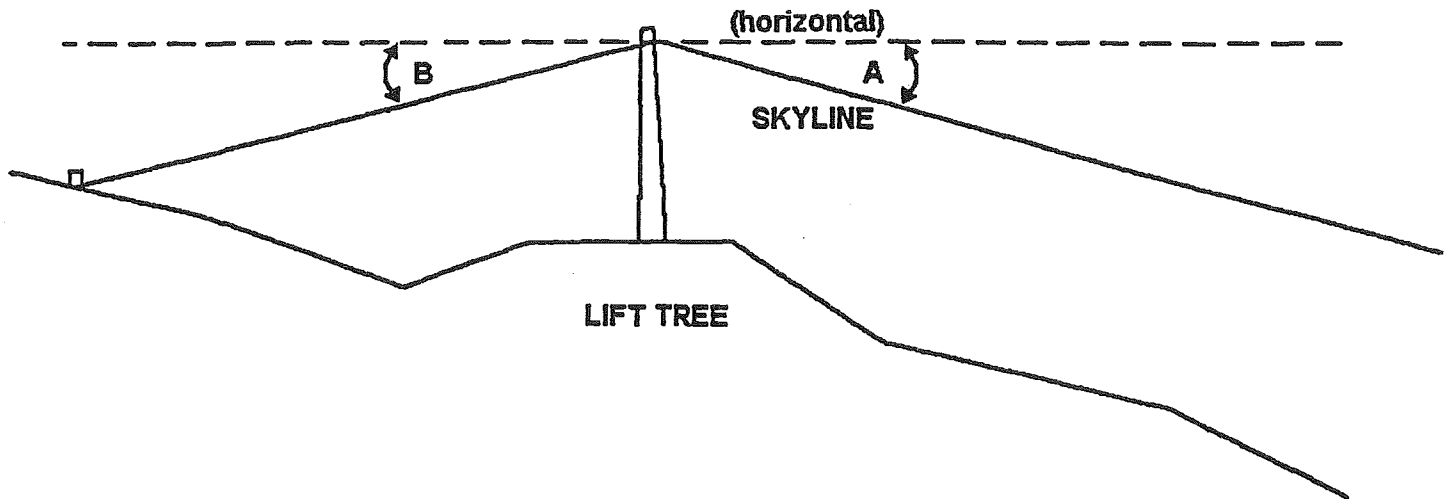


Figure 17: Positioning Guylines in Front of Tree

MAXIMUM ANGLE FOR LOAD BEARING GUYLINES AND SKYLINE

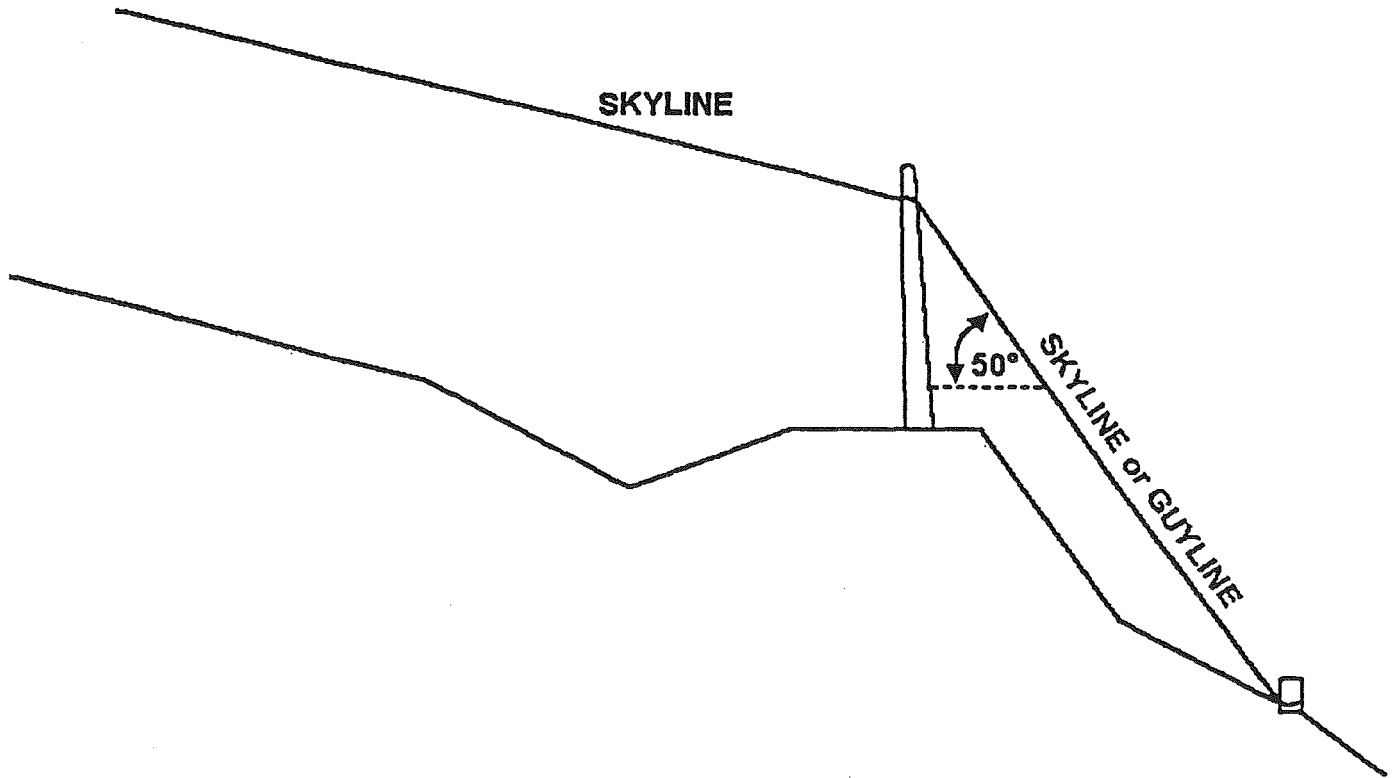


Figure 18: Maximum Angle for Load Bearing Guylines and Skyline

4 GUYLINE CASE – TAIL/LIFT TREE GUYING

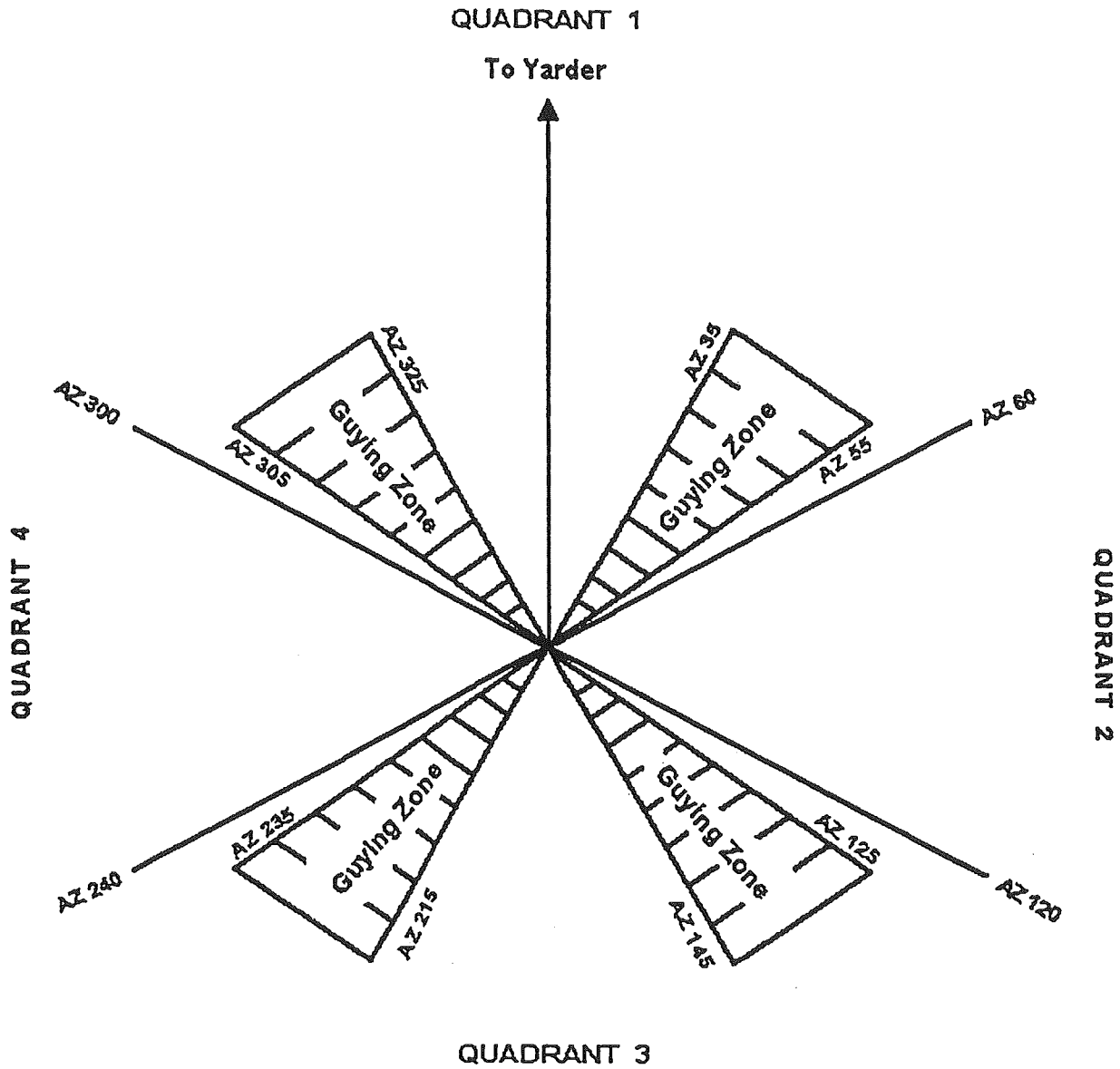


Figure 19: 4 Guyline Case – Tail/Lift Tree Guying

**2 GUYLINE CASE
TAIL/LIFT TREE GUYING
(gravity outhaul, non-slackpulling carriage)**

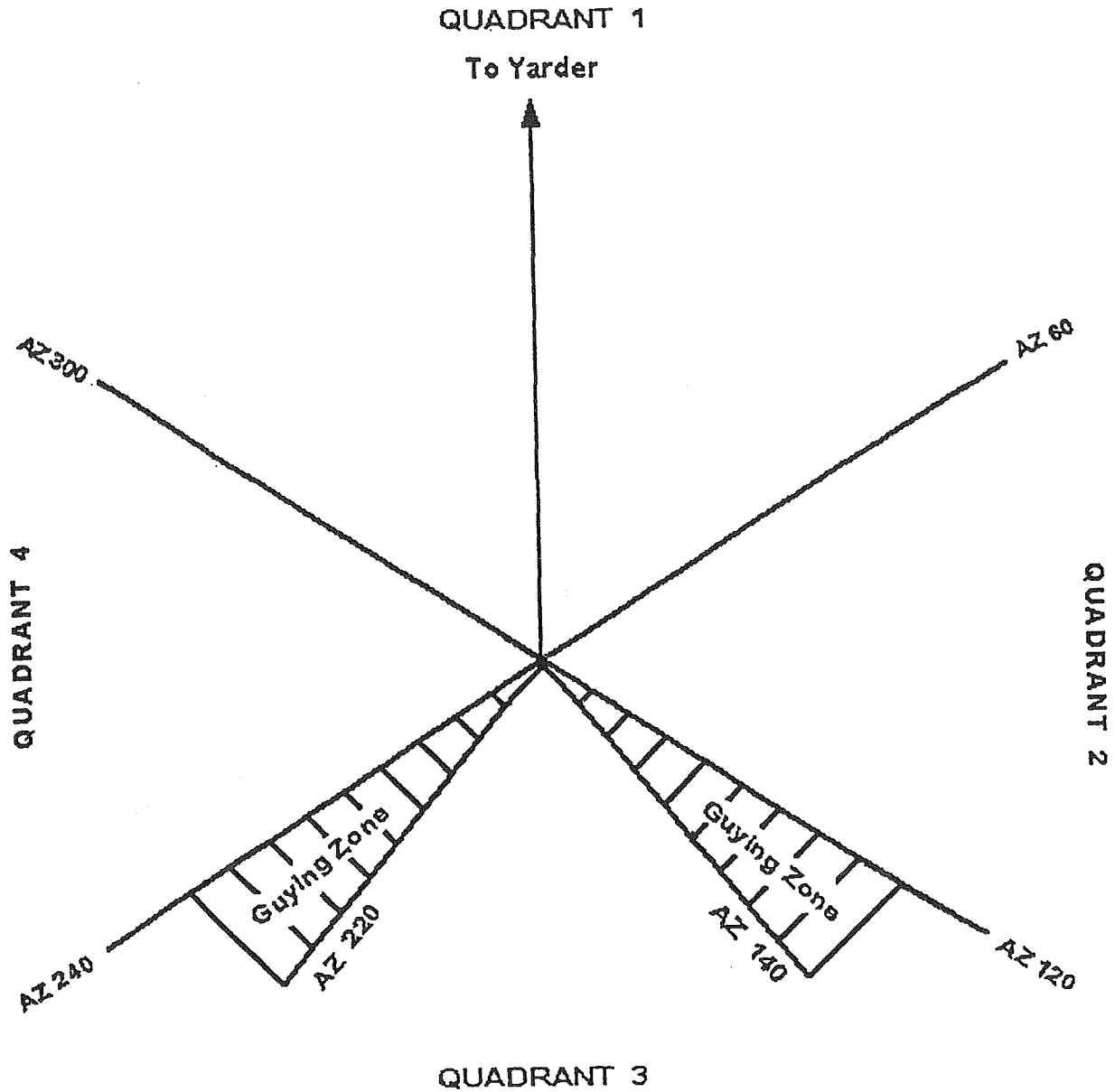


Figure 20: 2 Guyline Case – Tail/Lift Tree Guying
(gravity outhaul, non-slackpulling carriage)

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-561, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-561, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-561, filed 9/21/79.]

WAC 296-54-563 Guying tail/lift trees. (1) Whenever a tail/lift tree is within reach of the work area and the rigging is placed on the tail/lift tree at a height greater than five times the tree diameter (dbh), at least two guylines must be used unless tree size and strength and rigging position eliminate the need for guylines or employees must be in the clear before the go-ahead signal is given.

(2) Guylines on tail/lift trees must not be anchored to standing trees unless:

(a) There is no danger that the guyline anchor tree will enter the work area;

(b) The guyline anchor tree is properly tied back; or

(c) Employees are in the clear of the guyline anchor tree(s) before the go-ahead signal is given.

(3) When guylines are required, they must be positioned according to Figure 16: Positioning Guylines in Back of Tree and Figure 19: 4 Guyline Case - Tail/Lift Tree Guying as follows:

(a) When the angle between the horizontal and skyline coming into the tree (angle A in Figure 16) is less than the angle between the horizontal and the skyline leaving the tree towards the anchor point (angle B in Figure 16), the guylines must be in back of the tail/lift tree as specified in Figure 19.

(b) If angle A is greater than angle B, then the guys must be placed in front of the tail/lift tree. This situation usually occurs when a tail/lift tree is used during downhill yarding as shown below. Placing the guys on the uphill side only helps to pull the tail/lift tree over uphill.

(c) If a suitable anchor is not available within a specified shaded zone, two guylines may be used instead of one guyline, provided a guyline is placed on either side of and as near as possible to the affected shaded zone.

(4) Tail/lift trees must be supported by additional guylines if necessary, to ensure the stability of the tree.

(5) Guylines for tail/lift trees may be made of synthetic material and must be used according to the manufacturer's recommendation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-563, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-563, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-563, filed 9/21/79.]

WAC 296-54-565 Intermediate support trees. (1) Trees used as intermediate supports must be sound and straight from the ground to the point of strap attachment; and must be rigged so that:

(a) Carriage clearance, as measured at the base of the support tree(s) is approximately five feet.

(b) The jackline/support line (see Figure 21: Critical Measurements of the Double Tree Intermediate Support System) is a single piece of line that is one-eighth inch larger than the tong or skidding line or rigged to provide a strength equal to a line one-eighth inch larger than the tong or skidding line.

(2) Vertical support trees must be firmly rooted.

(3) The base of all leaning tree supports must be prevented from moving by:

(a) Retaining twenty percent of the stump diameter in holding wood; or

(b) Other suitable rigging arrangements.

(4) Double tree supports must be rigged so that (see Figure 22: Double Tree Intermediate Support System):

(a) The minimum and maximum heights of the jack relative to the height of the block are as shown below:

(b) The angle the block line makes with the center line of the support tree is as follows:

(i) For skylines one and one-eighth inch and smaller, ten degrees in any direction; and

(ii) For skylines larger than one and one-eighth inch, deflection of the block is in the direction of the jack and a maximum of ten degrees.

(c) The loaded support tree does not displace more than two feet at the point of rigging attachment.

(5) Intermediate support trees must be adequately guyed to withstand any stress to which the tree may be subjected.

(6) Single tree supports must be guyed as follows:

(a) For skylines one and one-eighth inch and less, as shown in Figure 4; and

(b) For skylines larger than one and one-eighth inch, as shown in Figure 6.

(7) Double tree supports must be guyed as follows:

(a) For skylines one and one-eighth inch and less, no guys are required;

(b) For skylines larger than one and one-eighth inch, as shown in Figure 4.

(8) Guylines for intermediate support trees may be made of synthetic material and must be used according to the manufacturer's recommendations.

CRITICAL MEASUREMENTS OF THE DOUBLE TREE INTERMEDIATE SUPPORT SYSTEM

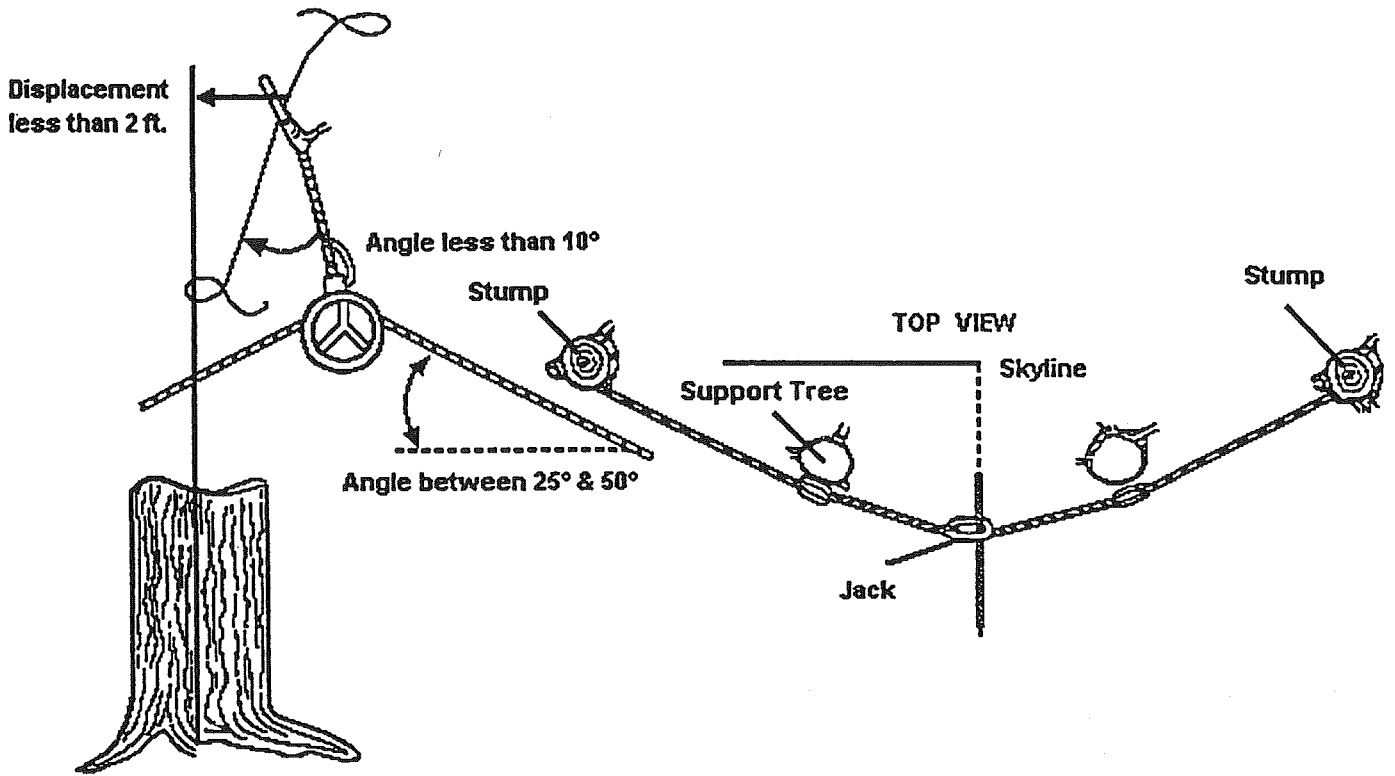
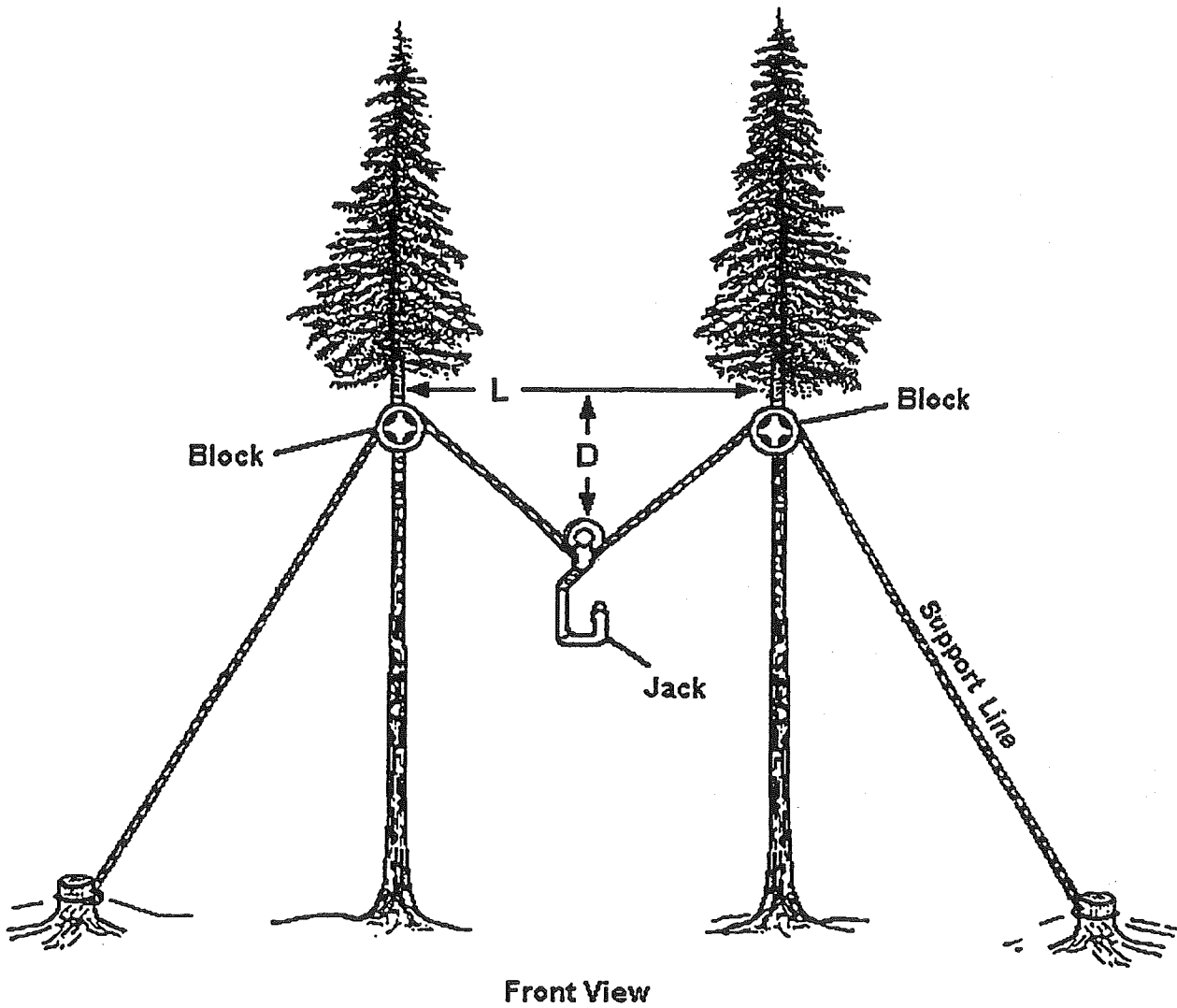


Figure 21: Critical Measurements of the Double Tree Intermediate Support System

**DOUBLE TREE
INTERMEDIATE SUPPORT SYSTEM**



$D = .25 \times L = \text{minimum distance}$

$D = .5 \times L = \text{maximum distance}$

Figure 22: Double Tree Intermediate Support System

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-565, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-565, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-565, filed 9/21/79.]

WAC 296-54-567 Rigging skylines. (1) A skyline must not make an angle greater than fifty degrees measured from the horizontal as it leaves the tail/lift tree. (See Figure 18: Maximum Angle for Load Bearing Guylines and Skyline.)

(2) When rigged in a tail/lift tree, the skyline must be anchored no more than eight degrees offline from the rearward projection of the skyline. If a suitable anchor is not available within the specified zone and the tail/lift tree is stable, a more suitable anchor outside the zone may be used. (See Figure 23: Skyline Positioning Limits Tail/Lift Tree.)

(3) A skyline must not be considered a guyline.

(4) Extensions to skylines must be equal in breaking strength to the skyline to which they are attached and must not alter the safe capacity of the tower. In addition, the extension must be attached only by a regular long splice or by a flush pin straight side shackle connecting the two eyes.

Note: See exception in WAC 296-54-553 (4)(e).

(5) Live, running or standing skylines must be anchored by one of the following methods:

(a) Directly to a stump or suitable manufactured anchor;

(b) Directly to the base of a standing tree provided the point of attachment is no more than three feet above the ground and no part of the tree will enter the work area if pulled over;

(i) If the tree will enter a work area, it must be properly tied back; or

(ii) Employee(s) must be in the clear before the go-ahead signal is given.

(c) By passing the skyline through a jack or block hung on a tail/lift tree before being anchored.

(6) Skylines or mainlines must be secured by one of the following methods:

(a) With at least two and one-half wraps, well spiked, or properly clamped (see WAC 296-54-569 (5)(b)); or

(b) Choked by using an approved shackle over the skyline or mainline with the pin through the eye; or

(c) With an approved strap having both eyes hung in a shackle and the knockout pin or safety pin through the eye of the skyline or mainline.

(7) Attaching the end of the skyline or slackline to the base of the rigged tail/lift tree is prohibited.

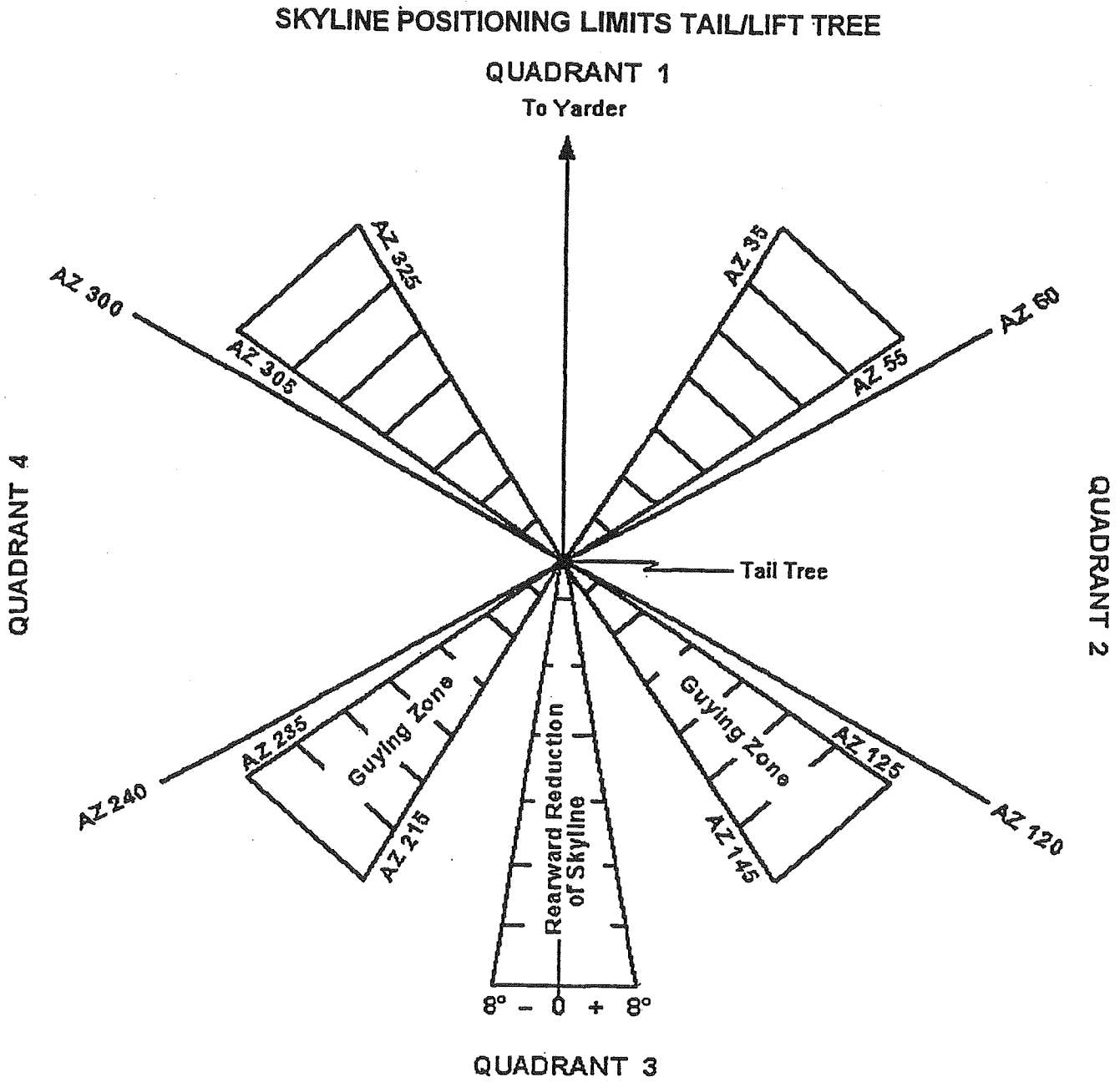


Figure 23: Skyline Positioning Limits Tail/Lift Tree

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-567, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-567, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040 and 49.17.050. 81-05-013 (Order 81-3), § 296-54-567, filed 2/10/81. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-567, filed 9/21/79.]

WAC 296-54-569 Anchoring. (1) Stumps used to anchor guylines and skylines must be carefully chosen for position, height, and strength. When necessary, stump anchors must be tied back to distribute the load.

(2) Stump anchors when spiked must be barked where attachments are to be made.

(3) Stump anchors must be adequately notched to keep the line in place and not adversely affect the stump strength.

(4) Employees must not stand close to the stump or tree or in the bight of lines as the guyline or wraps are being tightened.

(5) When spikes or cable clamps are used, guylines or skylines must be anchored with at least two and one-half wraps around the stumps. Wraps must:

(a) Be well secured with at least eight spikes or six staples in sound wood on the first and last wrap; or

(b) Have the end of the line secured with two wire rope clips on lines up to one inch diameter and three wire rope clips on lines one inch diameter and over.

(6) Properly installed deadman anchors are permitted. Guylines must not be directly attached to deadman anchors. Suitable straps or equally effective means must be used.

(7) Guylines of portable spars, wood spars or towers must not be anchored to standing trees if the unit is used as a head tree, except as specified in subsection (8) of this section.

(8) In special cases such as hanging on foreign ownership or in cable thinning operation where frequent moves make the retrieval of fell guyline trees difficult, the following will apply:

(a) Standing trees within reach of a work area or haul road may be used provided:

(i) They are solid;

(ii) Have a sound undisturbed root system;

(iii) If fell, would be suitable for a guyline stump or tailhold as required in subsection (1) of this section; and

(iv) Are properly tied back to distribute the load; or

(b) Guyline and/or tailhold anchor trees, when located so they will not fall into the work area or haul road, need not be tied back if stable.

Note: Under no circumstances must an employer accept a requirement, or be required to use standing trees to anchor guylines.

(9) Rock bolt anchors must be grouted, installed, tested, and maintained according to the rock bolt manufacturer's recommendations.

(10) Anchors must be regularly inspected while the logging operation is in progress. Insecure or hazardous anchors must be corrected immediately.

(11) Artificial earth anchors must be installed and used according to their design specifications and manufacturer's recommendations.

(12) Mobile equipment may be used to anchor skylines, running lines and guylines, provided the weight of the machine or other methods are used to ensure machine stability for all applied loads.

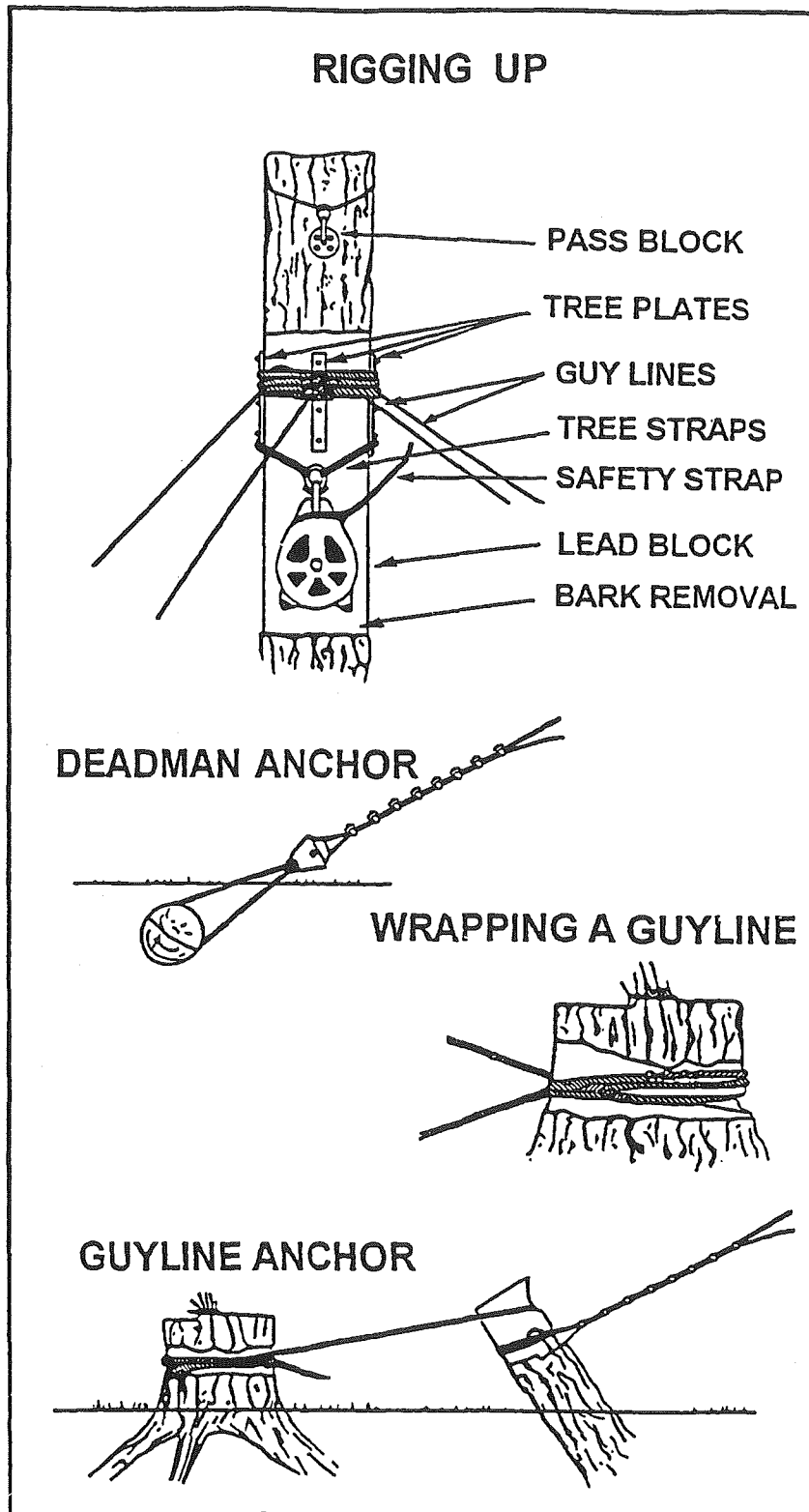


Figure 24: Rigging Illustrations

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-569, filed 8/18/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-54-569, filed 4/10/90, effective 5/25/90. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-569, filed 9/21/79.]

WAC 296-54-571 Releasing spiked guylines and spiked skylines from anchors. The following procedures must be followed when removing spiked guylines or spiked skylines from stumps:

- (1) Reversed safety wrap is put on and secured before loosening the last wrap;
- (2) An authorized employee is in charge of loosening guylines or skylines;
- (3) The authorized employee uses all precautions and gives warning before releasing lines; and
- (4) Safety holdbacks are used when necessary for employee safety.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-571, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-571, filed 9/21/79.]

WAC 296-54-573 Logging machines—General. (1)

All logging machinery must have speed limiting devices, safety stops, or emergency shut down devices or shut off valves, with the controls located so that in the event of an emergency, the prime mover may be shut down from a safe place.

- (2) Machine operators must be experienced in operating the equipment they use.

EXCEPTION: Inexperienced employees may operate equipment to gain experience while in training but may do so only while working under the immediate supervision of an experienced authorized person.

- (3) All machine controls must be marked as to their purpose in the operation of the machine.
- (4) The rated capacity of any vehicle transporting a machine must not be exceeded.
- (5) Machines must be loaded, secured, and unloaded in a manner that will not create a hazard for any employee.

Note: This requirement includes the loading, securing and unloading of a machine on and off a transport vehicle.

(6) The employer must not make any modifications or additions that affect the capacity or safe operation of the equipment without written approval of the manufacturer or a qualified engineer. If modifications or changes are made, the capacity, operation and maintenance instruction plates, tags, or decals, must be changed accordingly. The original safety factor of the equipment must never be reduced.

(7) Equipment must be classed and used according to the manufacturer's rating. Where low gear ratios or other devices are installed to increase the line pull in accordance with subsection (6) of this section, the size of the rigging must be increased accordingly so that it will safely withstand the increased strains.

(8) Each machine, including any machine provided by an employee, must be maintained in serviceable condition and the following:

- (a) Each machine must be inspected before initial use during each workshift. Defects or damage must be repaired or the unserviceable machine is replaced before beginning work.
- (b) Operating and maintenance instructions must be available on the machine or in the area where the machine is being operated. Each machine operator and maintenance

employee must comply with the operating and maintenance instructions.

(c) Each machine must be operated only from the operator's station or as otherwise recommended by the manufacturer.

(d) Employees must not be allowed to ride on any load.

(9) The yarding machine or vehicle, including its load, must be operated with safe clearance from all obstructions.

(10) While manual/mechanized falling is in progress, all logging machines must be operated at least two tree lengths away from trees being fell.

EXCEPTION: This provision does not apply to logging machines performing tree pulling operations or logging machines called upon by the cutter to ground hazard trees. All cutters must be notified of the logging machine entrance into the area and all falling within two tree lengths of the logging machine must stop.

(11) If a hydraulic or pneumatic storage device can move the moving elements such as, but not limited to, blades, buckets, saws and shears, after the machine is shut down, the pressure or stored energy from the element must be discharged as specified by the manufacturer.

(12) Loads must not exceed the rated capacity of the pallet, trailer, or other carrier.

(13) Boom-type logging machines must have a boom stop to prevent over-topping of the boom.

(14) Boom points of timber booms must be equipped with metal straps, plates, or other devices as needed to properly secure eyebolts and fittings used to support lines, blocks, or other rigging.

(15) Logging machine sleds or bases must be strong enough to withstand any stresses imposed upon them.

(16) Stationary logging machines must be securely anchored or otherwise stabilized to prevent unintended movement while yarding or skidding.

(17) Logging machines and their components must be securely anchored to their bases.

(18) Logging machines must be kept free of flammable waste materials and any materials that might contribute to slipping, tripping or falling.

(19) A safe and adequate means of access and egress to all parts of logging machinery where persons must go must be provided and maintained in a safe and uncluttered condition. Machine access systems, meeting the specifications of the Society of Automotive Engineers, SAE J185, June 1988, "Recommended Practice for Access Systems for Off-Road Machines," must be provided for each machine where the operator or any other employee must climb onto the machine to enter the cab or to perform maintenance. Walking and working surfaces of each machine and machine work station must have a slip-resistant surface to assure safe footing.

(20) Enclosed-type cabs installed on mobile logging machines must have two means of exit. One may be an emergency exit and be available for use at all times regardless of the position of the side arms or other movable parts of the machine. An easily removable window is acceptable as the emergency exit if it is large enough for an employee to readily exit.

EXCEPTION: Mobile logging machines manufactured before July 1, 1980 are not required to have two means of exit.

(21) Before leaving the operator's station of a machine, the operator must ensure the machine is secured as follows:

- (a) The parking brake or brake locks must be applied;
- (b) The transmission must be placed in the manufacturer's specified park position; and
- (c) Each moving element such as, but not limited to, blades, buckets, saws and shears, must be lowered to the ground or otherwise secured.

(22) Storing employee property, tools, or other miscellaneous materials on or within three feet of any logging machine is prohibited if retrieving the items would expose an employee to the hazardous pinch point area between the rotating superstructure and the nonrotating undercarriage.

(23) Employees must approach the hazardous pinch point area only after informing the operator of that intent and receiving acknowledgment from the operator that the operator understands the employee's intention. All logging machines must be stopped while any employee is in the hazardous pinch point area.

(24) After adjustments or repairs are made, logging machines must not be operated until all guards are reinstalled, safety devices reactivated, and maintenance equipment removed.

(25) Fairleads must be properly aligned at all times and designed to prevent line damage.

(26) Employee(s), except a mechanic or employee in training to operate equipment, must not ride on any mobile logging machine unless provided with seating, seat belts, and other protection equivalent to that provided for the operator.

(27) Riding on arches, reaches or turn of logs is prohibited.

(28) Tractors, skidders, arches, or logs being yarded by them must not run over or rub against anchored lines, tailhold stumps, or other rigging.

(29) Ends of lines attached to drums on logging machines must be secured by end attachments that develop the ultimate strength of the line unless three wraps of line are maintained on the drum at all times.

EXCEPTION: This does not apply to tractors or skidders.

(30) Wire rope must be wound on drum spools in a manner to prevent excessive wear, kinking, chafing or fouling.

(31) Guylines required in rigging spars or towers must be evenly spooled to prevent fouling.

(32) A guide pulley, tool, stick, iron bar or other mechanical or manual means must be used when guiding lines onto drums. Guiding lines onto drums with any part of the body in direct contact with the line is prohibited.

(33) A limit switch must be installed on electric-powered log loaders to prevent the lift arms from traveling too far in the event the control switch is not released in time.

(34) All forklift type log handling machines must be equipped with a grapple system and the arms must be closed whenever logs are being carried.

(35) When forklift machines are used to load, unload, or handle trailers, a positive means of holding the lifting attachment on the fork must be installed and used.

(36) Loads on forklift type log handling machines must be transported as low as safely operable without obstructing visibility.

(37) Guyline drum controls and outrigger controls must be separated and clearly identified in a manner that will prevent the engaging of the wrong control.

(38) Each machine must be equipped with guarding to protect employees from exposed moving elements, such as, but not limited to, shafts, belts, pulleys on chains, sprockets and gears in accordance with the requirements of this standard and chapter 296-24 WAC, Part C, Machinery and machine guarding. Guards must be in place at all times when machines are in use.

Note: This does not apply to lifting or yarding components such as, but not limited to, cable nip points, sheaves and blocks.

(39) Each machine used for debarking, limbing, and chipping must be guarded to protect employees from flying wood chunks, logs, chips, bark, limbs, and other material in accordance with the requirements of this standard and chapter 296-24 WAC, Part C, Machinery and machine guarding.

(40) Grab rails must be provided and maintained in good repair on all walkways of stationary units elevated more than four feet.

(41) Towed equipment such as, but not limited to, skid pans, pallets, arches, and trailers, must be attached to each machine or vehicle to allow a full ninety degree turn; to prevent overrunning of the towing machine or vehicles; and to ensure that the operator is always in control of the towed equipment.

(42) Timbers used for masts or booms shall be straight-grained, solid, and capable of withstanding the working load.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-573, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-573, filed 9/21/79.]

WAC 296-54-57310 Logging machines—Chipping in woods locations. In-woods chipping must be performed according to the following:

(1) Chipper access covers or doors remain closed until the drum or disc stops completely.

(2) Infeed and discharge ports are guarded to prevent contact with the disc, knives, or blower blades.

(3) The chipper is shut down and locked out according to the lockout/tagout requirements of chapter 296-24 WAC, Part A-4, when an employee performs any servicing or maintenance.

(4) Detached trailer chippers are chocked when used on any slope where rolling or sliding of the chipper is reasonably foreseeable.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57310, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57315 Logging machines—Exhaust pipes. (1) Engines not equipped with turbochargers must be equipped with spark arrestors in compliance with the department of natural resources, chapter 332-24 WAC, requirements for spark-emitting equipment.

(2) Each machine muffler provided by the manufacturer, or their equivalent, must be in place at all times the machine is in operation.

(3) Exhaust pipes must be located or insulated to protect workers from accidental contact with the pipes or muffler and must direct exhaust gases away from the operator and other persons.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57315, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57320 Logging machines—Glass. Glass installed on logging machines must:

(1) Be free of deposits of oil and mud or defects that could endanger the operator or other employees;

(2) Be safety glass or a type that provides equal protection;

(3) Be removed or replaced if defective or broken glass impairs the vision of the operator; and

(4) Have an additional metal screen or guard installed where glass does not provide adequate operator protection from flying chokers, chunks, saplings, limbs, etc. The operator's vision must not be impaired.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57320, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57325 Logging machines—Brakes. (1) Brakes or dogs must be installed on all machine drums and maintained in effective working condition.

(2) Drum brakes must have an independent locking device that will hold the drum when the operator leaves the machine and the machine is not operating.

(3) Brakes must be protected from direct exposure to the elements or be designed or constructed to make them imperious to such exposure.

(4) At the start of each shift, logging machine operators must test all brakes before taking a load.

(5) Service brakes must be able to stop and hold each machine and its rated load capacity on the slopes over which it is being operated. Brakes must be effective whether or not the engine is running and regardless of the direction of travel.

(6) Self-propelled logging machines manufactured on or after July 1, 1985, must be equipped with braking systems as follows:

(a) A service braking system, which must be the primary means of stopping and holding the equipment;

(b) An emergency stopping system, which must be a secondary means of stopping the equipment in the event of any single failure of the service system; and

(c) A parking brake system, which must be used to continuously hold a stopped machine stationary within the limits of traction on any grade on which it is operated so as to allow the operator to leave the vehicle without the vehicle moving, and to prevent subsequent movement of the vehicle while unattended. The parking brake system must maintain this parking performance despite any contraction of brake parts, failure of the source of application, energy or leakage of any kind.

(7) The braking systems required in subsection (5) of this section must be installed, tested, and maintained according to the following Society of Automotive Engineers' (SAE) Recommended Practices:

(a) J1026-1982—Braking Performance—In Service Crawler Tractors and Crawler Loaders;

[Title 296 WAC—p. 1248]

(b) J1473-1984—Braking Performance—Rubber-Tired Construction Machines;

(c) J1178-1980—Minimum Performance Criteria for Braking Systems for Rubber-Tired Skidders.

(8) Self-propelled logging machines manufactured before July 1, 1985, must have braking systems installed, tested and maintained in as effective a condition as originally intended by the manufacturer.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57325, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57330 Logging machines—Outriggers.

(1) All outriggers must have a stable base under the outrigger or equivalent leveling pads as recommended by the equipment manufacturer.

(2) Outriggers must have a means to hold them in both the retracted and extended position.

(3) Hydraulic outriggers must have a positive holding device (velocity fuse, load check valve, manually operated valve or equivalent) to prevent movement of the piston in the event of a hose, fitting or other failure in the hydraulic system except when proper blocking is provided.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57330, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57335 Logging machines—Hydraulics.

(1) If failure of hydraulic lines could create a hazard to an equipment operator while at the operator's station, safeguards must be installed that will eliminate the hazard.

(2) Machines or equipment must not be operated when hydraulic fluid leakage creates contamination of the operator's workstation, means of access or egress, or creates other unsafe conditions such as fire hazard or control malfunction.

(3) Abrasive contact with hydraulic hoses, tubing or fittings must be eliminated before further use.

(4) Defective hydraulic hoses, lines and fittings must be replaced.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57335, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57340 Logging machines—A-frames.

(1) A-frames must be guyed or braced to provide stability and prevent tipping.

(2) A-frame bases must be secured against displacement and the tops must be securely bolted or lashed to prevent displacement.

(3) Where guylines are used, A-frames must have at least one snap guy and two guylines securely attached, anchored and spread to form an angle 70 degrees to 90 degrees opposite the direction of stress or strain.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57340, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57345 Logging machines—Moving. (1)

Operators must ensure that all employees are in the clear before initiating or continuing the movement of any mobile equipment. The machine must be operated far enough from employees and other machines so that operation does not create a hazard for an employee.

(2) At any time when moving logging machines, the driver must have a clear and unobstructed view of the direction of travel. When this is not possible, a signal person with a clear and unobstructed view of the direction of travel must be designated and used to direct the movement of the machine, or the machine must have an audible horn that is sounded.

EXCEPTION: This does not apply to tractors, skidders or tree harvesters during normal yarding operations.

(3) Where a signalperson is used, the equipment operator must move the equipment only on signal from the designated signalperson and only when the signal is distinct and clearly understood.

(4) When moving power units, persons other than the operator and the person in charge must not be permitted to ride on the unit.

(5) All obstructions that may reach the operator while moving a machine must be removed.

(6) When moving to areas within the immediate landing area, all employees must stay in the clear of the logging machine(s) or must inform the operator of the intent to approach or be near the machine(s).

(7) Mobile yarders and wheel or crawler loaders must not travel on road grades greater than 15 percent unless they are securely snubbed or towed, or have a braking system designed for such travel by the manufacturer.

(8) Crawler-type, track-mounted logging machines with manual transmissions must be equipped with a ratchet or other device that will prevent unintended disengagement or reversing of the machine and the operator must be informed of the proper technique.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57345, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57350 Logging machines—Tractors and skidders. (1) Operators must operate and control their machines in a safe manner and avoid operations in areas where machine stability may not be maintained.

(2) Winch lines on logging tractors or skidders must be attached to the drums with a breakaway device.

(3) Arches must be equipped with line guards.

(4) A turnaround, if needed for skidders, must be provided on all skidding roads every 500 feet.

(5) The following safe work procedures must be followed:

(a) Lines must not be allowed to trail behind the tractor or skidder where it may hang up and snap forward.

(b) Each machine must be positioned during winching so the machine and winch are operated within their design limits.

(c) Logs/trees must be chocked near the ends of the logs/trees whenever possible and safely positioned before traveling.

(d) Before climbing or descending grades, the proper gear must be selected to allow the engine to govern the tractor speed.

(e) On side hills, abrupt turns uphill must be avoided. The tractor or skidder must be backed downhill first then

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turned uphill. The turn may be slacked off as necessary to permit this maneuver.

(f) Tractor or skidder speed must be adjusted to the circumstances prevailing. Excessive or uncontrolled speed must be avoided.

(6) Where tractor and skidder operators or helpers, because of the nature of their work duties, are required to wear calk soled footwear, the decks and operating foot controls must be covered with a suitable nonslip material.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57350, filed 8/18/99, effective 12/1/99.]

WAC 296-54-57355 Logging machines—Protective structures for operators. (1) Each tractor, skidder, log stacker and mechanical felling device, such as tree shears or feller-buncher, placed into initial service after February 9, 1995, must be equipped with falling object protective structure (FOPS) and/or rollover protective structure (ROPS). The employer must replace FOPS or ROPS which have been removed from any machine.

EXCEPTION: This requirement does not apply to machines which are capable of 360 degree rotation.

(2) ROPS must be installed, tested, and maintained in accordance with the Society of Automotive Engineers SAE J1040, April 1988, "Performance Criteria for Rollover Protective Structures (ROPS) for Construction, Earthmoving, Forestry, and Mining Machines."

(3) The ROPS must be high enough and wide enough so that it will not impair the movements of the operator or prevent his immediate escape from the vehicle in emergencies and must allow as much visibility as possible. Clearance above the deck and the ROPS of the vehicle at exits must be at least fifty-two inches (1.3 meters).

(4) Certified roll-over protective systems must be identified by a metal tag permanently attached to the ROPS in a position where it may be easily read from the ground. The tag must be permanently and clearly stamped, etched or embossed indicating the name and address of the certifying manufacturer or registered professional engineer, the ROPS model number (if any) and the vehicle make, model or serial number the ROPS is designed to fit.

(5) Roll-over protective structure systems must be maintained in a manner that will preserve their original strength. Welding must be performed by qualified welders only. (A qualified welder is defined under "welder qualification" in American Welding Society A.W.S. A3.0-69.)

(6) FOPS structures must be installed, tested and maintained according to:

(a) The society of automotive engineers SAE J231-1971, "minimum performance criteria for falling object protective structures (FOPS) prior to February 9, 1995."

(b) Society of automotive engineers SAE J231, January 1981, "minimum performance criteria for falling object protective structures (FOPS) for each tractor, skidder, log stacker, log loader and mechanical felling device, such as tree shears or feller-buncher, placed into initial service after February 9, 1995."

(7) The employer must replace FOPS that have been removed from any machine.

(8) Vehicles with ROPS or FOPS as required in subsection (1) of this section, must comply with the society of automotive engineers SAE J397a-1972, "deflection limiting volume for laboratory evaluation of roll-over protective structures (ROPS) and falling object protective structures (FOPS) of construction and industrial vehicles." Vehicles placed into initial service after February 9, 1995, must meet the requirements of SAE J397-1988.

(9) The opening in the rear of the ROPS on the crawler or rubber-tired tractors (skidders) must be covered with 1/4-inch diameter woven wire having not less than 1-1/2-inches or more than 2-inch mesh, or material which will afford equivalent protection for the operator.

(a) The covering must be attached to the structural members so that enough clearance is provided between the screen and the back of the operator.

(b) Structural members must be free from projections that would tend to puncture or tear flesh or clothing.

(c) Suitable safeguards or barricades must be installed, in addition to the screen, to protect the operator when there is a possibility of being struck by any material that could enter from the rear.

(10) Crawler and rubber-tired tractors (skidders) working in areas where limbs or brush may endanger the operator must be guarded.

(a) Shear or deflector guards must be installed on each side of the vehicle at an angle leading forward and down from the top front edge of the canopy of the vehicle, which will tend to slide the brush or limbs up and over the top of the canopy.

(b) Open mesh material with openings of a size that will reject the entrance of an object larger than 1-3/4-inches in diameter, must be extended forward as far as possible from the rear corners of the cab sides to give the maximum protection against obstacles, branches, etc., entering the cab area.

(c) Deflectors must also be installed ahead of the operator to deflect whipping saplings and branches.

(d) Deflectors must be located so as not to impede entrance to or exit from the compartment area.

(e) The floor and lower portion of the cab must be completely enclosed with solid material, except at entrances, to prevent the operator from being injured by obstacles which otherwise could enter the cab compartment.

(11) Enclosures for agricultural and industrial tractors manufactured after September 1, 1972, must be constructed, designed and installed as detailed in the society of automotive engineers technical report J168. Each machine manufactured after August 1, 1996, must have a cab that is fully enclosed with mesh material with openings no greater than 2 inches (5.08 cm) at its lease dimension. The cab may be enclosed with other material(s) where the employer demonstrates such material(s) provides equivalent protection and visibility.

EXCEPTION: Equivalent visibility is not required for the lower portion of the cab where there are control panels or similar obstructions in the cab, or where visibility is not necessary for safe operation of the machine.

(12) Overhead protection and other barriers must be installed to protect the operator from lines, limbs, and other moving materials on or over all loading or skidding machines

and on all yarding machines where the operator's station is mounted on board. The overhead covering of each cab must be of solid material and extend over the entire canopy. A skylight in a logging machine must be made of safety glass or provide equivalent protection.

Note: This does not apply to self-loaders.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-57355, filed 8/18/99, effective 12/1/99.]

WAC 296-54-575 Landing area. (1) Unless otherwise specified, landing areas must:

(a) Be large enough that if logs are to be heeled and swung, they will not strike standing timber, rigging, or other equipment or objects;

(b) Be large and level enough to land and deck the logs in the turns so that they will not slide or roll in the direction of employees or equipment. This is not intended to restrict the yarding and/or loading of logs for pole piling or an infrequent long break or tree length, provided the log is secured before unhooking the choker;

(c) Be large enough for safe movement of all logs and machinery;

(d) Landings must be free of root wads, limbs, tops, etc., that constitute a safety hazard; and

(e) Not have materials pushed, thrown, or dumped over the edge in a manner or at a time that will endanger employees.

(2) When during roadside thinning, logs stacked on the roadside without a landing must be placed in a stable condition.

(3) During uphill yarding, the landing chute must be cleared of logs before the next turn of logs is landed unless:

(a) The logs are fully contained in the landing chute; or

(b) There is no possibility that employees working below the landing may be struck by rolling objects coming off the landing.

(4) Roadside or continuous landings must be large and wide enough to safely operate and maintain the yarding or loading equipment. Outrigger pads, tracks or wheels must be on firm, stable ground.

(5) In logging operations where the yarder is set up in the haul road and logs are landed on the slope below the road, the following must apply:

(a) If the landing chute slope is twenty percent or less, logs may be landed and decked in the chute provided the logs can be left in a stable position;

(b) If the landing chute slope exceeds twenty percent, decking is not permitted in the chute if a chaser is required to unhook the rigging from the logs or if employees are working below the landing chute and are exposed to rolling or sliding logs;

(c) If logs are to be decked below the road, the logs must be effectively secured from rolling or sliding down the hill; or

(d) If the landing process or weather conditions (rain, snow, ice, mud) prevent the required log stability and exposes employees to the hazard of rolling or sliding logs, the logs must be decked at a different location.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-575, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-575,

filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240. chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-575, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-575, filed 9/21/79.]

WAC 296-54-577 Yarding, skidding, landing. (1)

Running lines must be arranged so that employees are not required to work in the bight of the line. When employees must work in the bight, employees must move out of the bight of the lines before the signal to move the turn is given, or be in a position where they are protected by standing timber, terrain, or other objects large enough to ensure their safety.

(2) Choker holes must be dug from the uphill side of the log when there is danger of the log rolling or moving.

(3) Chokers must be placed near the end of the log/tree whenever possible.

EXCEPTION: When long logs or tree-length logs are being yarded and a long end is necessary to safely land the logs/trees on the available landing space.

(4) Employees must be in the clear of logs, root wads, chunks, hazardous trees, rolling material and rigging before the go-ahead signal is given and must stay in the clear until all rigging movement has stopped.

(5) Employees must move away from the turn so as to be above or behind the turn and in the clear. They must remain on their feet and face the turn before the go-ahead signal is given.

(6) All employees must remain away from rigging that is stopped at a hangup, until the rigging has been slacked to reduce the hazard.

(7) Chokers must not be hooked or unhooked until all rigging is stopped completely.

(8) Logs must not be landed until all employees, trucks or equipment are in the clear.

(9) Logs must not accumulate in the landing chute to the point where they become a hazard to the landing personnel.

(10) Logs must be stable and secure before being approached by employees and before chokers are unhooked.

(11) An employee must not buck, limb or trim logs from a position that will expose the employee to contact with moving lines.

(12) Logs must not be placed in, moved about, or removed from the bucking area of the landing unless all employees are in the clear.

(13) An unimpaired horizontal clearance of at least three feet must be maintained between the rotating superstructure of any logging machine working on a landing and any adjacent object or surface. If this clearance cannot be maintained, a safety zone barrier must be used to isolate the hazardous area. The safety zone barrier may be a warning line constructed of rope or ribbon, supported on stanchions.

(14) "DANGER 36-INCH CLEARANCE" must be marked near the rear of the machine.

(15) Employees must not approach a machine's working circle until the operator has acknowledged that it is safe to do so.

(16) Whenever possible, chokers must be set from the uphill side of a log. Persons must not be on the lower side of a log which appears to be unstable or likely to roll.

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(17) When yarding during the hours of darkness, the area must be lighted enough to allow employees to safely perform their duties. The source of light must be located and directed to create minimum shadows and glare. If using a portable tailhold, lights must be directed on equipment to allow the person to visually determine that the tailhold equipment remains stabilized.

(18) Each yarded tree/log must be placed in a location that does not create a hazard for an employee and in an orderly manner so that the trees/logs are stable before bucking or limbing is commenced.

(19) When using a yarder, loader or skidding machine, the location of the machine or position of the yarder must be such that the operator will not be endangered by incoming logs or debris.

(20) Employee(s) must be assigned to flag on roads or provide other equivalent protection where hazardous conditions are created from logging such as, but not limited to:

(a) Running wire rope lines or rigging across road grades, excluding guylines and standing skylines if lines remain a safe distance above the road to allow a vehicle to pass under; or

(b) The movement of logs, chunks, or debris across or suspended over road grades.

EXCEPTION: Where there is no through traffic, such as on a dead end road or where the property owner's permission or proper authority is granted to close a section of road, warning signs and barricades may be used instead of flagger(s).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-577, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-577, filed 9/21/79.]

WAC 296-54-579 Log decks. (1) Logs must be placed in and removed from decks in a straight and orderly manner so as to minimize the hazards from rolling or shifting logs.

(2) If employees are working on the ground near the deck, the deck must be constructed and located so it is stable and provides each employee with enough room to safely move and work in the area.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-579, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-579, filed 9/21/79.]

WAC 296-54-581 Helicopter logging—General. (1) Prior to daily logging operations, a briefing must be conducted. The briefing must set forth the plan of operation for the pilot(s) and ground personnel. Anytime a change in operating procedure is necessary, affected personnel must be notified.

(2) Employees and equipment must remain in the clear and employees must never be under a suspended load.

(3) Employees must not work under hovering craft except for that limited period of time necessary to guide, secure, hook/unhook loads, and perform maintenance/inspections or other related job duties.

(4) The location of the drop zone, decking areas, loading areas, and designated safety zones must be established by a pilot and a responsible supervisor taking into consideration current operating conditions.

(5) Personal protective equipment.

(a) Employees must wear high visibility hard hats secured by a chinstrap.

(b) Employees hooking and receiving the load must wear high visibility vests or outer garments.

(6) Whenever approaching or leaving a support helicopter with blades rotating, employees must:

(a) Remain in full view of the pilot and keep in a crouched position;

(b) Obtain a visual or audible acknowledgment from the pilot before entering or exiting the helicopter;

(c) Avoid the area from the cockpit or cabin rearward unless authorized by the helicopter company to work there; and

(d) Exercise special caution to keep clear of rotors when visibility is reduced.

(7) Before approaching or departing the service area for maintenance, visual and/or audible communication must be established.

(8) There must be reliable communication available between the helicopter, woods crew, landing, and service areas. In the absence of radio communication there must be a designated signal person.

(9) Developed hand signals must be clearly communicated and understood by all persons working in the area who may be affected by their use.

(10) Riding the load or hook of a helicopter is prohibited except in an emergency.

(11) Unauthorized employees must not be allowed to approach within fifty feet of the helicopter when the rotor blades are turning.

(12) Every practical precaution must be taken to provide for the protection of employees from flying objects in the rotor downwash.

(13) Loads must be properly slung. Tag lines used by ground personnel to position loads must be of a length that will not permit their being drawn up into rotors. Pressed sleeve, swaged eyes, or equivalent means must be used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-581, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-581, filed 9/21/79.]

WAC 296-54-58110 Helicopter logging—Landing.

(1) The landing drop zone must be large enough for the longest logs to be landed without endangering the landing crew.

(2) Landing crew must remain in the clear until the load is placed flat on the ground and chokers are released from the hook.

(3) Landings must be constructed with minimal slope for drainage in the drop zone and a decking area to prevent logs from rolling.

(4) The approach to the landing must be kept clear and long enough to prevent tree tops from being pulled into the landing.

(5) Landing personnel must be notified when chokers are being picked up.

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(6) If the load will not release from the hook, the hook must be on the ground or at eye level, whichever is safer, before employees approach to release the hook manually.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58110, filed 8/18/99, effective 12/1/99.]

WAC 296-54-58120 Helicopter logging—Yarding.

(1) Helicopters must not work in areas near enough to cutters to cause the rotor wash to affect a cutter's ability to safely control a tree or to cause dislodging of limbs.

(2) The yarding helicopter must be equipped with a siren to warn employees of any hazardous situation.

(3) Log pickup must be arranged so that the hookup crew will not work on slopes below fell and bucked timber that appears unstable and likely to roll.

(4) If the load must be lightened by the hooker, the hooker must remain on the uphill side of the load and slack given to the entire load before releasing the hook.

(5) If the load must be aborted or lightened by the pilot, the hooker must be in the clear before releasing the hook.

(6) Employees must remain in the clear as chokers are being delivered. Under no circumstances can employees move under the chokers being delivered or take hold of the chokers before they are placed on the ground.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58120, filed 8/18/99, effective 12/1/99.]

WAC 296-54-58130 Helicopter logging—Fueling area.

(1) Separate areas must be designated for landing logs and for fueling helicopter(s).

(2) Refueling any helicopter with either aviation gasoline or Jet B (turbine) type fuel while the engine is running is prohibited.

(3) Helicopters using Jet A (turbine-kerosene) type fuel may be refueled with engines running provided the following criteria are met:

(a) Unauthorized employees must not be allowed within fifty feet of the refueling operation or fueling equipment; and

(b) Fire extinguishers must be strategically located in the fueling area and must have a combined rating of at least 20A:120BC.

(4) All fueling employees must be thoroughly trained in the refueling operation and in the use of the available fire extinguishing equipment they may be expected to use.

(5) The following are prohibited within fifty feet of the fueling area or fueling equipment:

- Smoking;
- Open flames;
- Exposed flame heaters;
- Flare pots; and
- Open flame lights.

EXCEPTION: Aircraft preheaters are not prohibited. However, no fueling may be performed while the heaters are in operation.

(6) The fueling area must be posted with "no smoking" signs.

(7) Because there are many causes of static electricity, fueling employees must assume that it is present at all times. Before starting refueling operations, the fueling equipment and the helicopter must be bonded and the fueling nozzle

must be electrically bonded to the helicopter. Using conductive hose is not an acceptable method of bonding. All grounding and bonding connections must be electrically and mechanically firm to clean unpainted metal parts.

(8) To control spills, fuel must be pumped either by hand or power; pouring or gravity flow is prohibited. Self-closing nozzles or deadman controls must be used and must not be blocked open. Nozzles must not be dragged along the ground.

(9) In case of a spill, the fueling operation must be immediately stopped until the person in charge determines that it is safe to resume.

(10) Helicopters with their engines stopped while being refueled with aviation gasoline or Jet B (turbine) type fuel, must comply with subsection (4) through (9) of this section.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58130, filed 8/18/99, effective 12/1/99.]

WAC 296-54-583 Loading logs. (1) A positive means of communication must be established and used between the truck driver and the employee loading logs to control the movement of the log truck being loaded.

(2) Employees must not be permitted alongside or underneath trucks being loaded or on the load until communication has been established with the loading machine operator and the truck driver, and the employee is assured that it is safe to be there.

(3) Logs being moved or loaded must not pass over any employee or an occupied vehicle, equipment or truck cab.

(4) Standing between a truck cab and a log being loaded or unloaded is prohibited.

(5) Logs must not be lowered to the bunk while bunk or block adjustments are being made or until the employee making these adjustments is in the clear.

(6) Standing underneath a suspended trailer or its reach is prohibited.

(7) Loads must be built up or loaded in a manner to be stable without the use of wrappers. Wrappers are considered only as precautionary measures to ensure stability of the load.

(8) Where there is a danger of the grapple slipping off of logs, straps must be used in loading logs that are too large for the grapple or tongs and must be hung in both eyes.

(9) Logs must be loaded in a manner to prevent excessive strain on wrappers, binders, bunk stakes, bunk chains or straps.

(10) Logs in any tier or layer unsecured by stakes or cheese blocks must be well saddled and have their diameter centers inside the diameter centers of the outer logs of the next lower tier or layer.

(11) Bunk and wing logs must extend at least twelve inches beyond the front and rear bunks or stakes. When fixed bunks are used, logs must extend at least six inches beyond the front and rear bunk or stake.

(12) Double-ended logs above the stakes must not be loaded on the side of the load from which the binders or wrappers are intended to be released.

(13) Logs must be loaded so that no more than one-third of the weight of any log extends beyond the end of the logs or bunk supporting it.

(14) Logs must be loaded in a manner that will not impair full and free movement of the truck.

(2001 Ed.)

(15) Each log not contained within the stakes must be secured with at least two wrappers before the truck leaves the vicinity of the landing/loading area.

(16) All of the required wrappers must be placed on the load within sight of the landing/loading area so immediate emergency assistance can be given if necessary.

(17) Loads or logs must not be moved or shifted while binders are being applied or adjusted.

(18) The transport vehicle must be positioned to provide working clearance between the vehicle and the deck.

(19) All limbs or knots that would project beyond the stakes or legal height must be removed before the log is loaded on the car or truck.

Note: This does not apply to incidental limbs/knots placed on loads during the normal loading process.

(20) Power saws must not be operated on top of loaded logging trucks.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-583, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-583, filed 9/21/79.]

WAC 296-54-584 Tongs, hooks, grapples. (1) Tongs must be maintained in good condition, properly aligned and with sharp points.

(2) Tongs must not be carried by being rested on both shoulders with the tong points around the neck.

(3) When loading logs, straps of sufficient size and length must be used where there is a danger of tongs or hooks pulling out of the log.

(4) When loading logs, tongs may be used on large logs if the logs are barked and notched to ensure a secure hold.

(5) The closing line must be securely attached to the grapple according to the manufacturer's recommendations.

(6) Loading hooks and tongs must be securely attached on the loading line with screw shackles or equivalent devices.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-584, filed 8/18/99, effective 12/1/99.]

WAC 296-54-585 Cross-haul systems. (1) In cross-haul (parbuckle) or roll-on loading systems, the skid timbers must be strong enough to support the logs being loaded and long enough to remain in place while the log is being loaded.

(2) Loaders on cross-haul systems must work beyond the ends of the logs being loaded.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-585, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-585, filed 9/21/79.]

WAC 296-54-587 Self-loading log trucks. (1) A safe means of access and egress must be provided to the operator's loading work station.

(2) Self-loading log truck operators must not unload their own load unless a positive means of securing the logs is provided when binders and wrappers are removed.

(3) New self-loading log trucks purchased and put in operation after January 1, 1980, must be equipped with:

(a) A check valve installed on the jib boom; and

(b) A seat that is offset from the point of attachment of the boom. The seat and boom structure must rotate concurrently.

(4) The operator of a self-loading log truck must not heel the log over the operator's work station.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-587, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-587, filed 9/21/79.]

WAC 296-54-589 Log trucks—General. (1) Prior to use, the operator must make a complete daily inspection of the truck and trailer with particular attention to:

- Steering apparatus;
- Lights and reflectors;
- Brake boosters;
- Brake hoses and connections;
- Reaches;
- Hitches (couplings);
- Bunks;
- Stakes;
- Bunk blocks.

The brakes must be tested before and after movement of the vehicle. The operator must submit a written list of necessary repairs to a person designated by the employer.

(2) Any defective parts that would make the vehicle unsafe to operate, must be replaced or repaired before the vehicle is placed in service.

(3) Motor vehicles used on roads not under the control of the state department of transportation, counties, or cities must be equipped with accessories necessary for a safe operation including:

(a) Operable head lamps;

(b) At least two tail lamps and brake lamps that emit a red light plainly visible from a distance of one thousand feet to the rear; and

(c) Two reflectors visible at night from three hundred fifty feet when directly in front of properly adjusted motor vehicle head lamps.

(4) The driver must do everything reasonably possible to keep the truck under control at all times and must not operate in excess of a speed at which the driver can stop the truck in one-half the visible distance.

(5) The area between the truck frame members, extending from the cab rearward as far as necessary to provide a safe work area, must be covered with suitable nonslip type material.

(6) Log trucks that have logs scaled at stations must have a platform on each side extending outward from the frame members at least eighteen inches, and must be eighteen inches long or as near to eighteen inches as the design of the truck permits. The treading surface of the platforms must be of nonslip material and the platform must be able to safely support a five hundred pound load.

(7) To protect the operator of vehicles from loads, there must be a substantial bulkhead behind the cab that extends up to the height of the cab.

(8) When at the dump or reload or where logs are scaled or branded on the truck, the logs must be scaled or branded before the binders are released.

(9) All vehicles, where vision of the operator in the direction of travel is impaired by the load or vehicle, must be moved only on a signal from a worker who has a clear view in the direction in which the vehicle is to be moved.

(10) Where a bridge or other roadway structure is posted with a load limit sign, log truck drivers or operators of other heavy equipment are prohibited from driving a load in excess of the posted limit over such a structure.

(11) All passengers must ride in the cab of the log truck.

(12) All trucks must keep to the right side of the road except where the road is plainly and adequately posted for left side travel.

(13) A method must be provided to ensure that the trailer will remain mounted on the truck while driving on highways or logging roads.

(14) When trucks are towed on any road, the person guiding the vehicle being towed must, by prearranged signals, govern the speed of travel. Vehicles must be towed at a reasonable speed and in a prudent manner. A tow cable or chain over fifteen feet in length must have a white flag attached at the approximate center, however, it is recommended that a rigid tow bar be used for this purpose.

(15) All rubber-tired motor vehicles must be equipped with fenders. Mud flaps may be used instead of fenders whenever the motor vehicle is not designed for fenders.

(16) All trucks must be equipped with doors with operable latches, or a safety bar or strap.

(17) Log trucks must not approach a landing while there is danger from incoming logs.

(18) While en route, the operator must check and tighten the wrappers/binders whenever there is reason to believe that the wrappers/binders have loosened or the load has shifted.

(19) Persons must not enter the area below a suspended load of logs.

(20) All trucks must be equipped with a means to protect the operator from inclement weather.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-589, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-589, filed 9/21/79.]

WAC 296-54-58910 Log trucks—Brakes. (1) Motor logging trucks and trailers must be equipped with brakes or other control methods that will safely stop and hold the maximum load on the maximum grade.

(2) All trucks with air brakes must be equipped with a readily visual or audible low air pressure warning device in good working order.

(3) An air loss rate out-of-service condition exists if an air leak is discovered and the reservoir pressure is not maintained when:

- (a) The governor is cut in;
- (b) Reservoir pressure is between 80 and 90 psi;
- (c) Engine is at idle; and
- (d) Service brakes are fully applied.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58910, filed 8/18/99, effective 12/1/99.]

WAC 296-54-58920 Log trucks—Trailer hitches and safety chains. (1) All log truck and trailer combinations must be equipped with approved hitches (couplings) which must:

(a) Be capable of withstanding, in any direction, the potential stresses imposed;

(b) Be of a design which would not be rendered inoperative by dirt and debris and must be locked securely and positively; and

(c) Be attached to the truck frame or extension of the truck frame by means of not less than four machine bolts and nuts (120,000 psi material or better) inch diameter or larger, secured by lock nuts. Other means of attachment furnishing strength equal to or greater than the above may be accepted if of approved design and application.

(2) Hitches (couplings) or parts that are broken, cracked, excessively worn, or otherwise defective hitches must be repaired before use.

(3) Each log truck and trailer combination or log truck and independent trailer combination must be provided with two or more safety chains or cables with a rated breaking strength of at least the gross weight of the towed vehicle, and:

(a) Able to hold the trailer in line in case of failure of the hitch assembly;

(b) Permanently attached to the frame of the truck or an extension of the truck frame;

(c) Form a separate continuous connection between the truck frame or extension of the truck frame and the reach or trailer;

(d) Attached not more than twelve inches from the eye of the reach or trailer;

(e) Short enough to prevent the trailer reach or tongue from contacting the ground in the event of disengagement from the truck;

(f) Designed to provide a positive connection that cannot be made inoperative by any condition of use or exposure.

(4) Safety chains and cables must be replaced immediately if they contain cut, cracked, or excessively worn links, or frayed, stranded, or otherwise defective wire rope.

(5) Butt welding of safety chain links to reach truck frame, or extension of truck frame is prohibited.

(6) Repairs to safety chains, such as cold shuts, are prohibited.

(7) Frames must not be welded or drilled into if the manufacturer recommends against it.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58920, filed 8/18/99, effective 12/1/99.]

WAC 296-54-58930 Log trucks—Reaches and bunks. (1) Log trailers must be connected to tractors by reaches of a size and strength to withstand all normal imposed stresses.

(2) Hand-holds or other facilities must be installed on trailer tongues or trailer reaches if workers are required to manually assist in coupling them to their tractors or trucks.

(3) The reaches of unloaded trailers being towed must have and use a minimum one-inch pin near the end or an equally effective means to prevent pulling or stripping through the tunnel.

(4) Reach locks, clamps, or tighteners must be of the type that will securely lock the reach in the tunnel.

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(5) All reaches must be the maximum size usable in the tunnel of a trailer.

(6) Altering a trailer tunnel to permit reduction of reach size is prohibited.

(7) Every truck or truck and trailer engaged in transporting logs loaded lengthwise must be equipped with bunks and chock blocks or stakes.

(8) Log bunks or any part of a bunk assembly bent enough to cause bunks to bind, must be straightened. Bunks must be sharp enough to prevent logs from slipping.

(9) All trucks with swivel bunks must have bunk locks or an equivalent system of holding the bunks in place while loading logs.

(10) The bunks or bolsters of any truck or trailer must be either curved upward or straight. Bunks with ends lower than their centers are prohibited.

(11) Enough clearance must be maintained between the bunk and the bunk rider to prevent bunk binding.

(12) Trailer bunks must have a false or tilt bunk. The channel of the bunk must be kept reasonably free of debris.

(13) Stakes and stake extensions must be installed and maintained so that the angle between bunks and stakes (and extensions if used) do not exceed ninety degrees when loaded.

(14) Frames, bunks, and running gear of log trucks must be maintained free of cracks, breaks and defects. If defects are found, they must be immediately repaired or the part replaced.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58930, filed 8/18/99, effective 12/1/99.]

WAC 296-54-58940 Log trucks—Stakes, stake extensions and chock blocks. (1) Trucks and trailers must be equipped with bunk stakes or chock blocks of strength and sized material to perform their intended function.

(2) All stakes, stake extensions, and bunks installed on log trucks and trailers, together with the means to secure and lock the stakes in hauling position, must be designed and constructed of materials of such size and dimension that will withstand operational stresses without yield or permanent set.

(3) Stake extensions made from axle shafts or other brittle material are prohibited.

(4) The linkage used to support the stakes or chocks must be of adequate size and strength to withstand the maximum imposed impact load. Molles or cold shuts are prohibited in chains or cables used for linkage.

(5) Stake chains or cables must be equal to or better than "high test" steel chain or "plow steel" wire rope, and of a size necessary to meet the requirements of a safe working load of at least six thousand six hundred pounds. (3/8-inch alloy chain, 7/16-inch high test chain of welded link construction, and 5/8 inch improved plow steel cable in 6x19 and 6x37 construction meet this requirement.)

(6) Bunk chains containing cut, cracked, excessively worn, or otherwise defective links, must be immediately removed from service. Molles, cold shuts (welded or otherwise), or bolts are not permitted in bunk chains.

(7) The use of frayed, stranded, or otherwise defective wire rope for chock block cable or stake straps is prohibited.

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(8) Only chain links approved for welding (and properly welded) or approved repair links that will develop strength equivalent to the chain, are permissible for repairs or attachments to stake chains or binder chains.

(9) Chains or cables used to secure stakes or chock blocks must be secured in a way that does not require hammering directly on them to release the stakes or blocks. Key-hole slots and similar methods of securing chains are prohibited.

(10) Deformed or defective stakes, stake securing or stake locking devices, or bunks must be immediately repaired or removed from service.

(11) Each stake and chock used to trip loads must be constructed so that the tripping mechanism is activated on the side opposite the release of the load.

(12) Trip type stakes must be properly secured and locked in a manner that will prevent them from accidentally tripping or falling.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58940, filed 8/18/99, effective 12/1/99.]

WAC 296-54-58950 Log trucks—Wrappers and binders. (1) On log trucks equipped with stakes, the following requirements must apply:

(a) In the hauling of a one log load, one wrapper chain or cable must be required and secured to the rear bunk. The log must be properly blocked or secured in a manner which will prevent it from rolling or shifting. An additional wrapper secured to the front bunk is optional.

(b) In the hauling of two log loads, not less than two wrapper chains or cables must be used to secure the load. The logs must be properly blocked to prevent them from rolling or shifting.

(c) On loads consisting of three or four logs not over forty-four feet in length, the load must be secured by not less than two properly spaced wrapper chains or cables. Ends of short logs not secured by such wrappers must be secured with extra wrappers. If any log is over forty-four feet in length, the load must be secured by not less than three properly spaced wrappers.

(d) Loads consisting of five or more logs, when the logs are all seventeen feet or less in length, must be secured by not less than two properly spaced wrappers. Loads consisting of five or more logs, when any log is over seventeen feet in length, must be secured by not less than three properly spaced wrappers.

(2) On log trucks equipped with chock blocks the following requirements must apply:

(a) In the hauling of a one log load, one wrapper chain or cable shall be required and secured to the rear bunk and the log must be properly blocked in a manner to prevent it from rolling or shifting.

(b) One additional wrapper chain or cable shall be required on log trucks using chock blocks over and above the requirements in subsection (1)(c) and (d) of this section.

(3) In the case of short logs loaded crosswise, the following method of securing the load must be used if the truck or trailer is not provided with solid ends of a height sufficient to prevent any log in the load from rolling off:

Not less than two chock blocks must be used at each open end of the vehicle and the load must be held with at least two wrapper chains or cables. The wrappers must be firmly attached to the end of the truck or trailer. Rigid standards or stakes may be used in lieu of chock blocks but each such standard or stake must be either rigidly connected to the bed of the truck or trailer or must be placed in a tight-fitting socket at least 1-2 inches in depth. Other means furnishing equivalent security may be acceptable.

(4) When two wrappers are required, they must be applied within six feet of the front and rear bunks. When more than two wrappers are required, the front and back binder must be applied within six feet of the front and rear bunks.

(5) To properly secure short logs, binders must be placed near the end, not less than twelve inches from the end of the log.

(6) Log(s) loaded on top or in outside saddles of a load must not be transported unless secured by at least two wrapper chains or cables, one of which must be placed near each end of such log.

(7) All wrappers and binders must be fastened in place prior to tightening to prevent the displacement of logs on the top of the load.

(8) All wrapper chains or cables, except in the case of one log load, must entirely surround the load. This does not apply to gut-wrappers.

(9) Gut-wrappers, when used, must be adjusted so as to be tightened by, but not carry the weight of the logs above them.

(10) A warning must be given before throwing wrappers over the load and care must be taken to avoid striking other persons with the wrapper.

(11) Each log not contained within the stakes must be secured with at least two wrappers before the truck leaves the vicinity of the landing/loading area.

(12) While moving logs, poles, or log chunks within sorting or mill yards, that could roll or slide off the truck due to snow or ice conditions, or the logs or log chunks do not extend beyond the stakes, at least two wrappers and binders must be used regardless of the height of the load.

(13) Wrapper chains or cables, binders, fasteners, or attachments thereof, used for any purpose as required by these standards must have a minimum breaking strength of not less than fifteen thousand pounds and must be rigged so that it can be safely released.

Note: 3/8-inch hi-test steel chain, 7/16-inch improved plow steel wire rope of 6x19 or 6x37 construction, or materials having equivalent strength, when in compliance with the requirements herein contained, will be acceptable. (The diameter of the wire rope is immaterial as long as it meets the minimum breaking strength requirements.)

Note: Nylon straps and ratchet binders having an equivalent breaking strength may be used when securing loads on (hay rack) log hauling systems.

(14) A loaded logging truck required to have wrappers by this section, may be moved within the loading area without wrappers only if such movement does not present a hazard to workers.

(15) For the purposes of this standard, applied bundle straps or banding are not acceptable as wrappers and binders.

(16) All loose ends of wrapper chains or cables must be securely fastened so as to prevent their swinging free in a manner that will create a hazard.

(17) Binders for securing wrappers on logging trucks must be fitted with hooks of proper size and design for the wrapper chain being used.

(18) Wrappers must be removed from service when any of the following conditions exist:

- (a) Excessively worn links on chains;
- (b) Deformed or stretched chain links;

- (c) Cracked chain links; or
- (d) Frayed, stranded, knotted, or otherwise defective wire rope.

(19) Pipe extension handles (swedes) for tightening or securing binders must be no longer than thirty-six inches. Care must be taken that a sufficient amount of the pipe extends over the binder handle.

(20) Defective binders must be immediately removed from service.

Note: See Figures 25 through 35 for illustrations of placement and number of wrappers.

PLACEMENT AND NUMBER OF WRAPPERS One Log Load

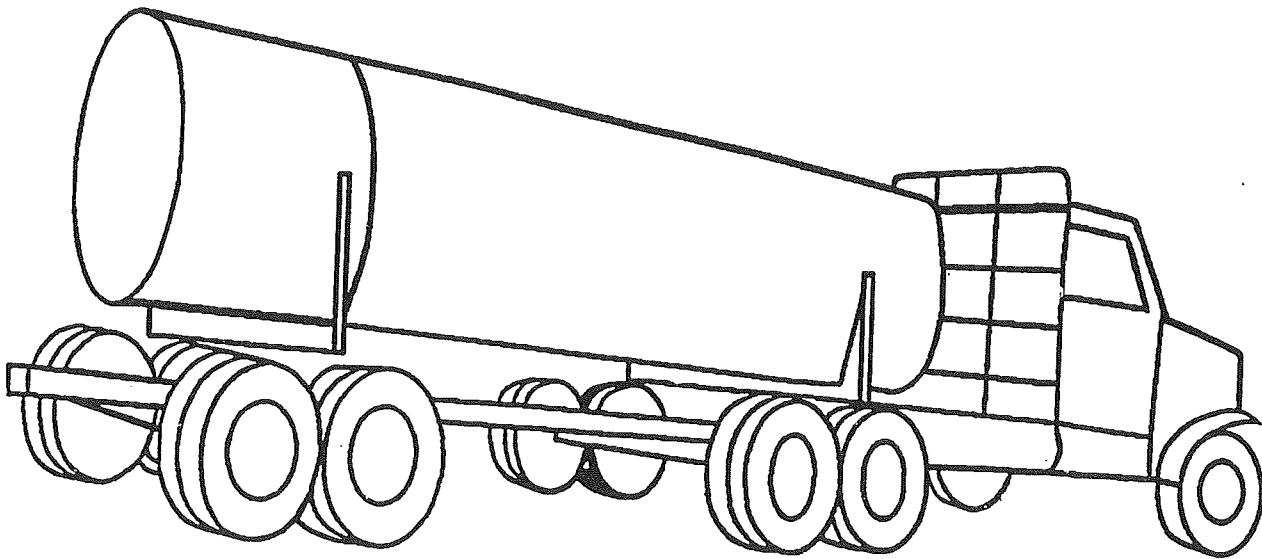


Figure 25: One Log Load

Two Log Load

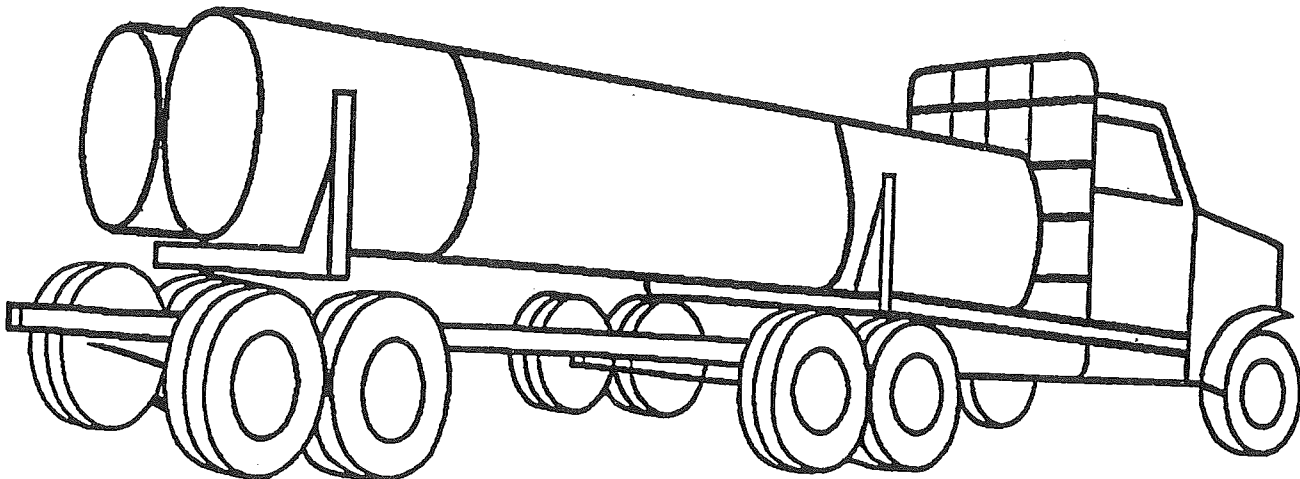


Figure 26: Two Log Load

Three or Four Log Load 44 Ft. or Less

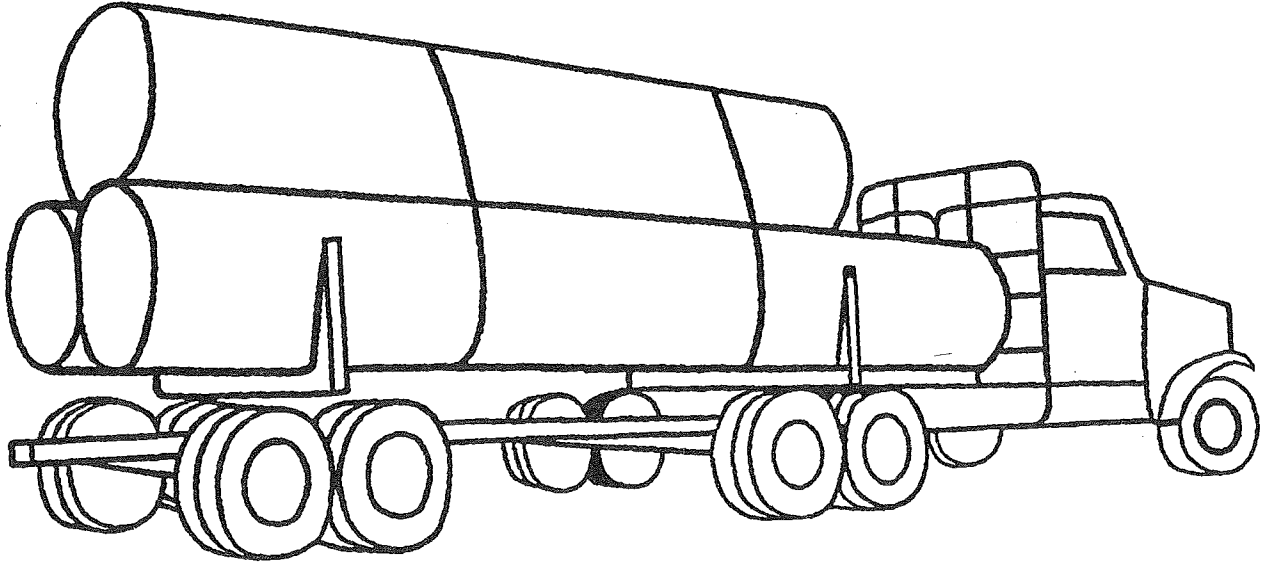


Figure 27: Three or Four Log Load 44 feet or less

Three or Four Log Loads More Than 44 Feet

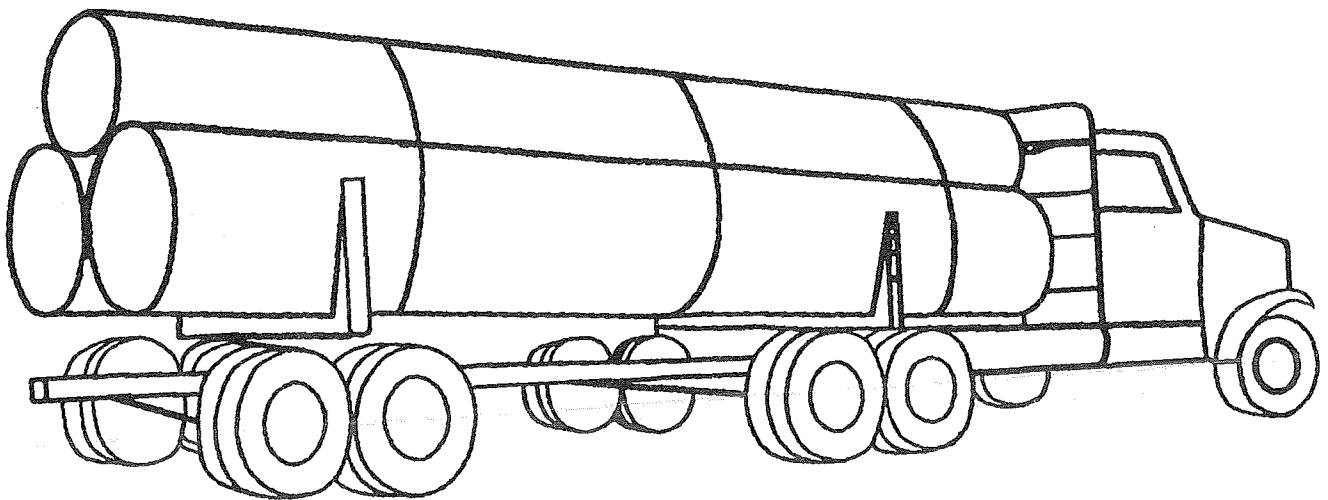


Figure 28: Three or Four Log Loads more than 44 feet

Five or Six Log Load All Logs 17 Feet or Less

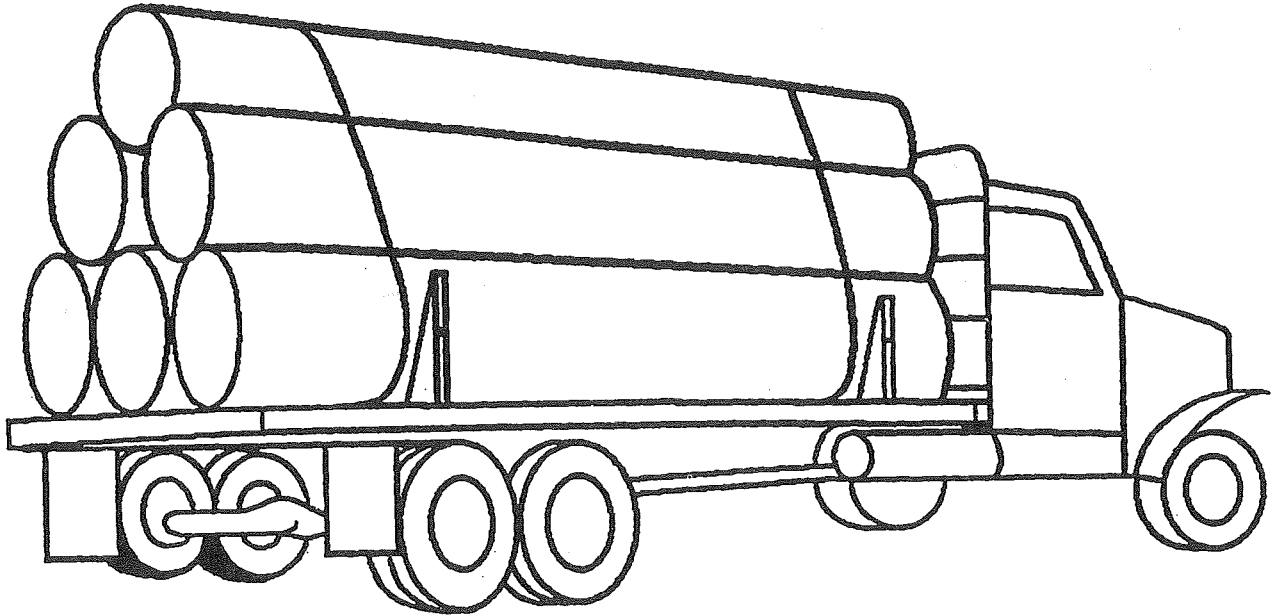


Figure 29: Five or Six Log Load All Logs 17 feet or less

Seven or More Log Load All Logs 17 Feet or Less

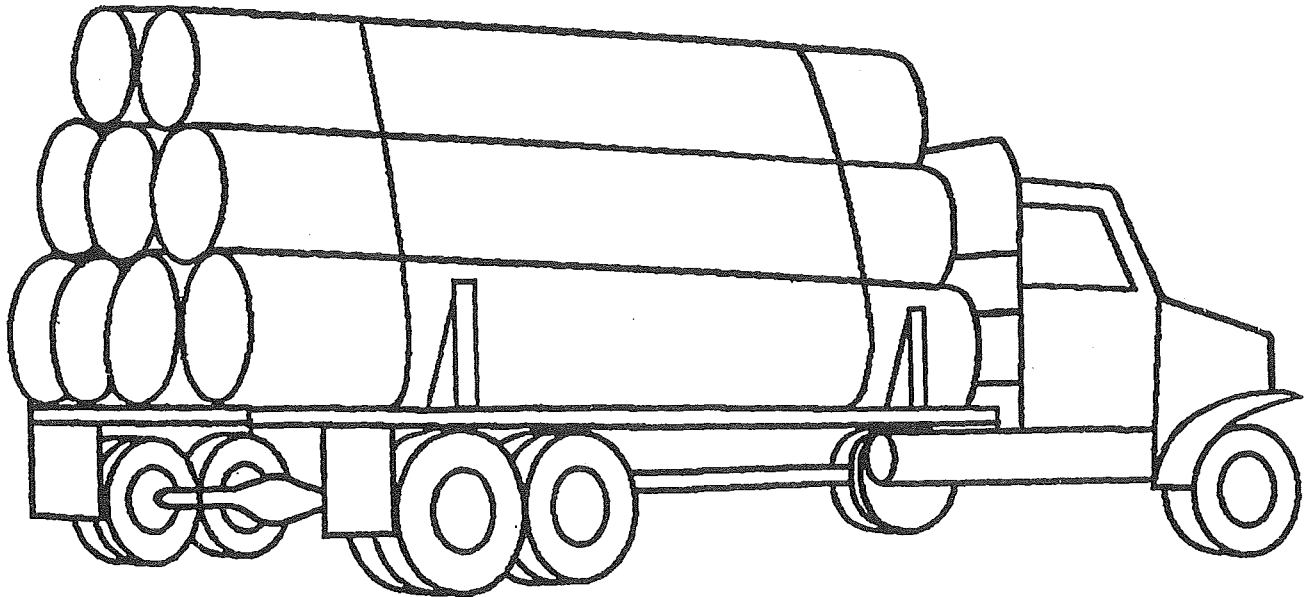


Figure 30: Seven or More Log Load All Logs 17 feet or less

Five or More Log Load if Any Logs Are More Than 17 Feet

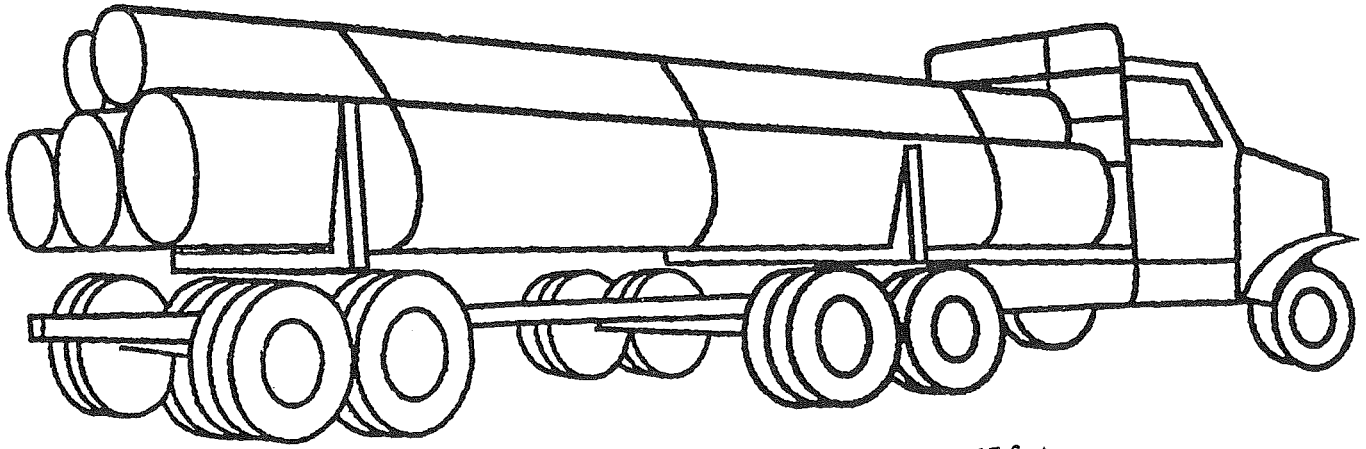


Figure 31: Five or More Log Load if any Logs are more than 17 feet

Proper Support for Logs

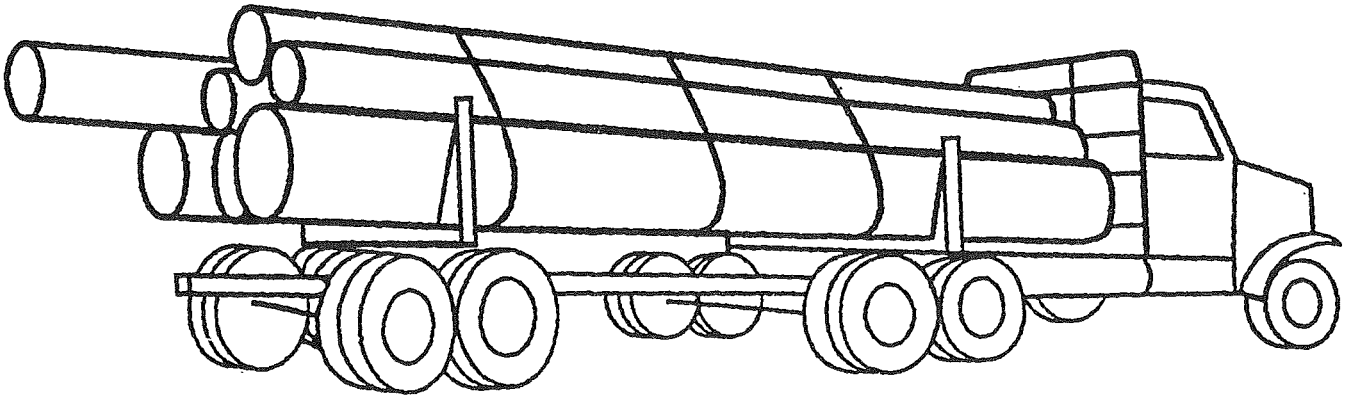


Figure 32: Proper Support for Logs

Outside Logs or Top Logs

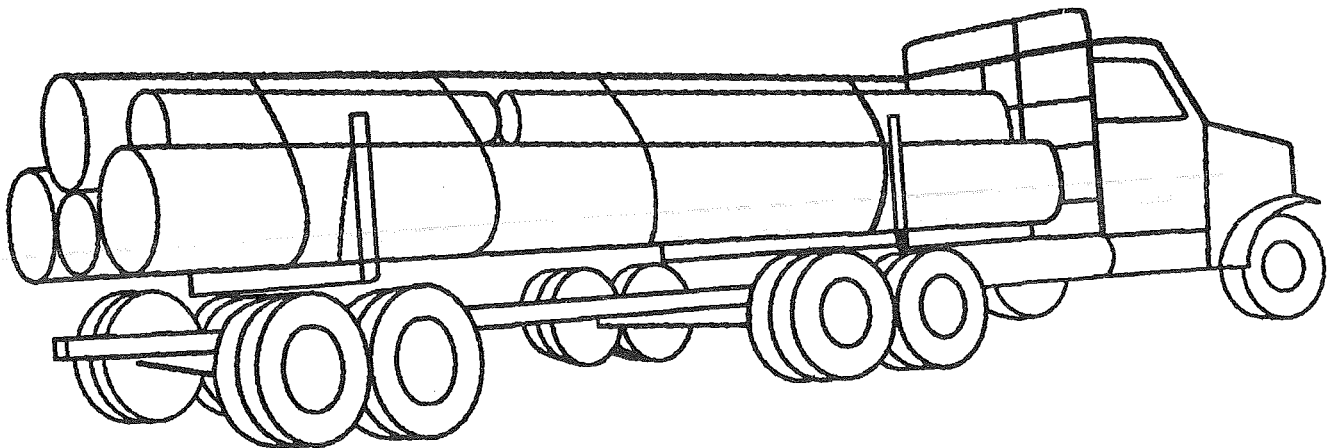


Figure 33: Outside Logs or Top Logs

A Wrapper Must Be Near Each Bunk

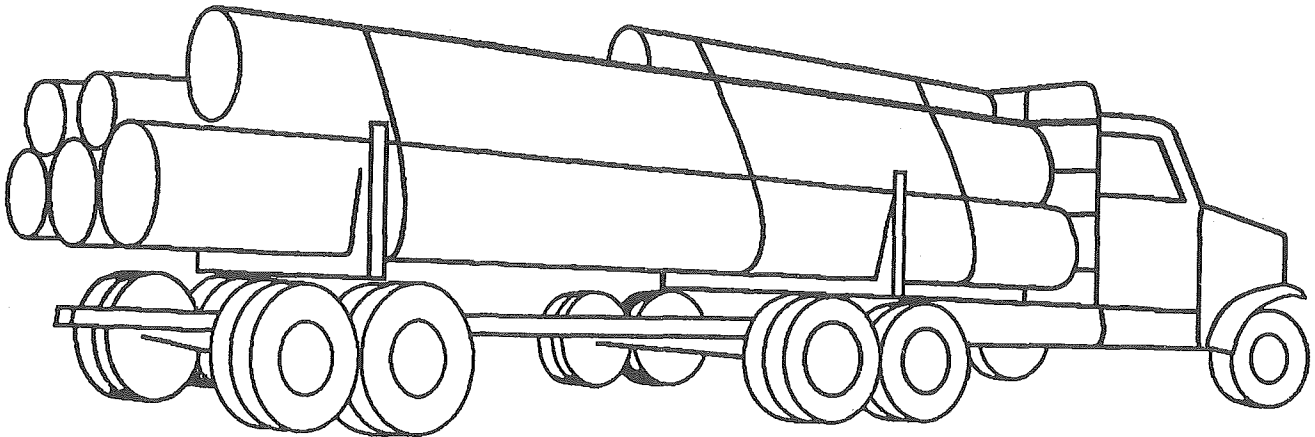


Figure 34: A Wrapper must be near each bunk

Short Logs Loaded Crosswise

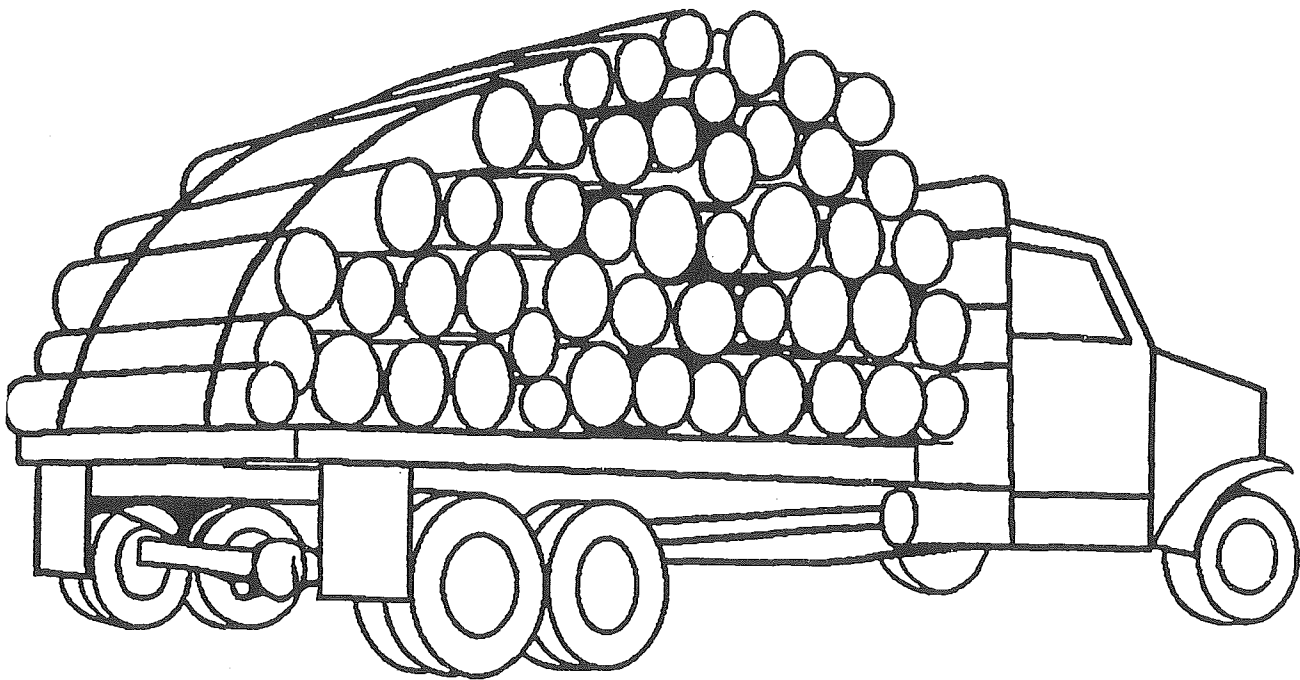


Figure 35: Short Logs Loaded Crosswise

Note: All loads of logs on logging trucks equipped with chock blocks instead of stakes, must have at least one additional wrapper over and above the requirements for trucks equipped with stakes, except on one and two log loads and trucks with short logs loaded crosswise.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58950, filed 8/18/99, effective 12/1/99.]

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[Title 296 WAC—p. 1261]

WAC 296-54-58960 Log trucks—Miscellaneous requirements. (1) A truck wheel must not have more than twenty-five percent of the lugs missing or defective.

(2) All truck wheels must be maintained free of cracks, breaks, or defects.

(3) Windshields on all equipment must have windshield wipers in good working condition.

(4) Mule train trailers must have a platform on the trailer tongue at least twelve inches by twenty-four inches made of nonslip material and able to support at least three hundred pounds. The platform must be self-cleaning.

(5) Trailer loading and unloading straps, links, or chains must be fastened securely to the trailer frame and used in hoisting the trailer. The connections must be maintained in good condition and not be attached to the trailer bunk. Using molles for this purpose is prohibited.

(6) When unloading trailers from trucks, the trailers must be hoisted clear, the truck driven forward a safe distance, and the trailer lowered to within one foot of the roadway before persons approach the trailer or reach.

(7) Trailer hoisting or unloading straps must be constructed and installed in a manner enabling the loading or unloading machine to engage the strap without manual personal contact.

(8) All motor vehicles must be equipped with a horn that is audible above the surrounding noise level. The horn must be sounded before operating the vehicle in reverse gear and when necessary to alert employees.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58960, filed 8/18/99, effective 12/1/99.]

WAC 296-54-58970 Log trucks—Steered trailers. Steered trailers, not controlled from the truck cab, must be designed, constructed, and operated as follows:

(1) A secure seat with substantial foot rest must be provided for the operator at the rear of the bunk. Any arrangement that permits the operator to ride in front of the bunk is prohibited unless a false bunk or other adequate protection is provided for the operator.

(2) The seat for the operator must be so arranged that he has an unobstructed exit from both sides and the rear.

(3) The bunk support must be so constructed that the operator has a clear view ahead at all times.

(4) Adequate means of communication must be provided between the operator and the truck driver.

(5) Eye protection and respirator must be provided for the operator.

(6) The trailer must be equipped with fenders or splash plates to protect the operator from mud and dust so far as possible.

(7) If used during periods of reduced visibility on roads not under the control of the state department of transportation, counties, or cities, the trailer must be equipped with head, tail, turn and stop lights.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-58970, filed 8/18/99, effective 12/1/99.]

WAC 296-54-591 Stationary log truck trailer loading. (1) All loading devices must be designed, constructed

and maintained so as to have a five to one safety factor for the rated load capacity.

(2) Loaders must be high and wide enough so they can safely load the maximum-sized trailers they are expected to handle without hanging up or striking the equipment.

(3) Electric-powered trailer loading devices must be equipped with a switch or device that will safely limit the upper direction of travel of the load line.

(4) Electric motors used for hoisting must be equipped with approved overload switches or breakers.

(5) Electrical switch controls must not exceed twenty-four volts. All control switches must be the momentary-contact type that require continuous manual pressure for the hoist to operate.

(6) Pendant control switches must be suspended by a chain or other suitable device that will prevent placing a strain on the electrical cable.

(7) Pendants must be installed so that the control switch does not touch the ground when retracted.

(8) All electrical equipment must be weatherproof-type or adequately protected from the weather, and must meet or exceed the requirements of the National Electrical Code as promulgated by the director of the department of labor and industries pursuant to RCW 19.28.060.

(9) Trailer loaders, except A-frames or bridge crane, must be equipped with reach guides or devices that will keep the reach in proper alignment. A tag rope or other safe guidance device must be used to guide trailers being loaded by an A-frame loader.

(10) Access roads and the area around the trailer loading devices must be kept free of standing water and debris and maintained in good repair.

(11) The maximum capacity load to be lifted must be posted in a conspicuous location where it can be easily seen by any person operating the hoist.

(12) Trailer loading equipment must be periodically inspected at least every thirty days and must be maintained in good repair. A written report must be made and signed by the person making the inspection and kept on file by the company for twelve months.

(13) The employer must conduct an annual lifting test on each loading device and maintain a written record of the test.

(a) The written record must contain:

- The date of the test;
- The name of person conducting the test;
- The amount of weight lifted; and
- The results kept in the office of the employer or at the site.

(b) The test weight must be at least one hundred twenty-five percent of the maximum rated load and a maximum of one hundred thirty percent of the maximum rated load.

(14) Each drum must be designed and arranged in such a manner that the line will maintain lead and spool evenly without chafing, crossing, or kinking.

(15) A braking system must be installed that has the ability to safely brake and hold one and one-half times weight of the full rated load.

(16) When trailers are to be loaded after dark, sufficient lights must be provided for a safe operation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-591, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-591, filed 9/21/79.]

WAC 296-54-593 Log unloading, booms, and rafting grounds—Storage and sorting areas—General. (1) At least two persons must be present for all storing, sorting, or boom work, except for boomboat operations.

(2) In operations where regular logging machinery, rigging, etc., is used, the applicable rules apply.

(3) The employer must provide and ensure the use of artificial lights where employees work between the hours of sunset and sunrise. The lights must be located in a manner that will:

- Be reasonably free of glare;
- Provide uniform distribution of illumination; and
- Avoid sharply defined shadows.

(4) On all log dumps, adequate power for the unloading method used must be provided. All machines used for hoisting, reloading, or lowering must be of an approved design and have enough power to control or hold the maximum load imposed in mid-air.

(5) Methods of unloading logs must be arranged and used in a manner to provide full protection to all employees.

(6) Binders must not be released from any load until an effective safeguard is provided.

(7) All mobile log handling machines must be equipped with a means to prevent the logs from accidentally leaving the forks, and it must be used.

(8) The operator of the unloading machine must have an unobstructed view of the unloading area or must make certain no one is in the area where the logs are to be unloaded. Rear-view mirrors must be installed on mobile log handling equipment to assist the operator in determining that the area behind the machine is clear before backing up.

(9) Unloading lines must be arranged so that it is not necessary for an employee to attach them on the pond or dump side of the load.

(10) Life rings with a minimum of ninety feet of 1/4-inch line with a minimum breaking strength of five hundred pounds attached, must be provided at convenient points adjacent to water that is five feet or more in depth. Life rings must be a minimum of thirty inches outside diameter and seventeen inches inside diameter and be maintained so as to retain a thirty-two pound positive buoyancy.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-593, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-593, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-593, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-593, filed 9/21/79.]

WAC 296-54-59310 Log unloading, booms, and rafting grounds—Water dumps. (1) All water dumps must have brow logs except when logs are lifted from the load. If portable equipment is used, adequate stops must be provided to prevent equipment from running off the dump.

(2) Where necessary for employees to walk alongside loads and equipment on trestles or fills, a minimum

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twenty-two inch wide walkway must be provided, unless otherwise specified.

(3) All decks and plankways on log dumps must be kept in good repair and free from bark and other debris. Roadways must not be inclined more than one inch to twelve inches across the driving surface.

(4) The use of small bridge-over logs, planking, or timbers between regular foot logs, or walkways, which will not support the weight of at least three persons are prohibited. All regular foot logs must be barked on the upper side.

(5) Electric-powered hoists using hand-held cord remote controls in grounded locations must be actuated by circuits operating at no more than twenty-four volts. All control switches must be the momentary contact type that require continuous manual pressure for the hoist to operate.

(6) Roadbeds at log dumps must be hard-packed gravel, heavy planking, or equivalent material, and must be of sufficient width and even surface to ensure safe operation of equipment.

(7) Where logs are unloaded on to rollways, enough space must be provided between the top of the skids and the ground to clear the body of a person.

(8) When a brow log is used with a parbuckle system, all persons are prohibited from going between the brow log and the load of logs at any time.

(9) A positive safeguard must be provided to prevent logs from leaving the loads on the side opposite the dump. Unloading lines, crotch lines, or other equivalent means must be arranged and used in a manner to prevent any log from swinging or rolling back.

(10) All employees must remain in the clear until all moving equipment has come to a complete stop.

(11) Logs must not be unloaded by peaves or similar manual methods, unless means are provided and used that eliminate the danger from rolling or swinging logs.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59310, filed 8/18/99, effective 12/1/99.]

WAC 296-54-59320 Log unloading, booms, and rafting ground—Boom and rafting grounds. (1) Breaking of log jams by peavy method is prohibited, except in river drive or when a jam occurs away from a mechanical means or the dump.

(2) Wooden pike poles must be made of continuous, straight-grained No. 1 material.

(a) Defective poles, blunt or dull pikes must not be used.

(b) Conductive pike poles must not be used where there is a possibility of coming in contact with energized electrical conductors.

(3) Stiff booms must be made of at least two boom sticks and must be at least thirty-six inches wide measured outside to outside of the logs. The boom sticks must be fastened with at least 4" x 6" cross ties, or cable lashings notched into the boom sticks may be used when stiff booms are exposed to heavy swells. Stiff booms must be kept free of loose bark and maintained in good repair.

(4) A walkway thirty-six inches wide with standard hand railing must be provided from the shore end of stiff boom to shore.

(5) All sorting gaps must have a substantial stiff boom on each side of gaps. Such stiff booms or walkways must be planked over.

(6) Boom sticks must be reasonably straight with no protruding knots or loose bark. They must be able to support above the water line at either end the weight of one employee and equipment or two hundred fifty pounds.

(7) Foot logs must be reasonably straight with no protruding knots or loose bark and large enough to support above the water line at either end the weight of two employees and equipment or five hundred pounds.

(8) Unsafe boom sticks must be marked by three chopped crosses ten feet from the butt end, and those sticks must not be used as boom sticks.

(9) Gaps between boom sticks must not exceed twenty-four inches. All wire must be removed from boom sticks and boom chains before they are re-used or hung in rafting stalls.

(10) When permanent cable swifters are used, they must be arranged so that they are within easy reach of the rafter without rolling the boom sticks on which they are fastened. When cables become hazardous to use because of jagers, they must be discarded.

(11) When a floating donkey or other power-driven machinery is used on a boom, it must be placed on a raft or float with enough buoyancy to keep the deck of the raft or float well above water. Wherever employees walk, the deck of the raft or float must be planked over with at least two inch planking, and kept in good repair.

(12) When doglines used in rafting, brailing, or stowing logs become hazardous to use because of jagers, they must be discarded.

(13) Sufficient walkways and floats must be installed and securely anchored to provide safe passage for employees.

(14) Walkways alongside sorting gaps must be at least four feet wide. Other walkways must be at least twenty-two inches wide.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59320, filed 8/18/99, effective 12/1/99.]

WAC 296-54-59330 Log unloading, booms, and rafting grounds—Boats and mechanical devices on waters.

(1) Before starting the boat motor, any spilled fuel must be removed and vapors must be exhausted from any area in which they may accumulate.

(2) The bilge area must be kept clean and oil, grease, fuel, or highly combustible materials must not be allowed to accumulate.

(3) Adequate ventilation equipment must be provided and used for the bilge area to prevent the accumulation of toxic or explosive gases or vapors.

(4) Adequate ventilation equipment must be provided and used for the cabin area on enclosed-cabin boats to prevent an accumulation of harmful gases or vapors.

(5) Deck and cabin lighting must be provided and used where necessary to provide safe levels of illumination aboard boats. Boats operated between sunset to sunrise, or in conditions of restricted visibility, must display navigation lights as required by the United States Coast Guard. Searchlights or

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floodlights must be provided for safe navigation and to illuminate working or boarding areas adjacent to the craft.

(6) On craft used by employees wearing calked shoes, all areas where employees must stand or walk must be made of or be covered with wood or other suitable matting or nonslip material. The covering must be maintained in good condition.

(7) Each boat must:

(a) Be provided with a fire extinguisher; and

(b) Have a life ring with at least fifty feet of one-fourth inch line attached.

Note: On log broncs, boomscooters, or other small boomboats where all occupants are required to wear life saving devices and a life ring would present a tripping hazard, the life ring may be omitted.

(8) Along docks, walkways, or other fixed installations on or adjacent to open water more than five feet deep, approved life rings with at least ninety feet of one-fourth inch line attached, must be provided. The life rings must be spaced at intervals not exceeding two hundred feet and must be easily visible and readily accessible.

(a) When employees are assigned work at other casual locations where exposure to drowning exists, at least one approved life ring with at least ninety feet of line attached must be provided in the immediate vicinity of the work assigned.

(b) Lines attached to life rings on fixed installations must be at least ninety feet long, at least one-fourth-inch in diameter, and have a minimum breaking strength of five hundred pounds. Similar lines attached to life rings on boats must be at least fifty feet long.

(c) Life rings must be United States Coast Guard approved thirty-inch size.

(d) Life rings and attached lines must be maintained to retain at least seventy-five percent of their designed buoyancy and strength.

(e) Where work is assigned over water where the vertical drop from an accidental fall would exceed fifty feet, special arrangements must be made with and approved by the department of labor and industries prior to such assignment.

(9) Log broncs, boomscooters, and boomboats must not be loaded with employees or equipment in a way that adversely affects stability or seaworthiness.

(10) Boats must not be operated at excessive speed or handled recklessly.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59330, filed 8/18/99, effective 12/1/99.]

WAC 296-54-59340 Log unloading, booms, and rafting grounds—Dry land sorting and storage.

(1) Unauthorized foot and vehicle traffic is prohibited in the sorting or storage area.

(2) Logs must be stored in a safe and orderly manner. Roadways and traffic lanes must be kept clear of protruding ends of logs and debris.

(3) Dry deck log storage areas must be kept orderly and maintained in a condition conducive to safe operation of mobile equipment. Roadways and walkways must have a smooth hard-packed surface wide enough to permit a safe operation. Bark, mud, and other debris must not be allowed to

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accumulate to the extent they constitute a hazard to the operation.

(4) The employer must implement an effective method to control dust at log dumps and in sorting and storage areas.

(5) Only an authorized person shall operate or ride any lift truck, log stacker, or log unloader.

(6) Signaling log unloader operators at dry deck areas by throwing bark or chips in the air is prohibited. Hand, horn signals or other safe, effective means must be used at all times.

(7) Unnecessary talking to the operator while operating controls of a log stacker or log unloader is prohibited.

(8) Lift forks and arms of unloading machines must be lowered to their lowest position, and all equipment brakes set before the operator leaves the machine unattended.

(9) Log unloaders or stackers must not be moved about the premises for distances greater than absolutely necessary with the lift extended above the driver's head or with loads lifted higher than is necessary for vision.

(10) When truck drivers are out of the cab, they must be in the clear, and in view of the log unloader before the lift forks are moved under the load and the lift is made.

(11) Where logs are offloaded onto a dry deck by unloading lines, a self-releasing mechanism must be used. Employees are prohibited from climbing dry decks to release unloading lines.

(12) Employees must not enter the hazardous area near or under loads of logs being lifted, moved, or suspended.

(13) When log unloaders and log stackers are designed so that logs being handled may jeopardize the safety of the operator, the employer must provide overhead protection and any other necessary safeguards.

(14) Log unloaders and log stackers must be equipped with a horn or other audible warning device. If vision is impaired or restricted to the rear, the warning device must be sounded before operating the vehicle in reverse gear and periodically while backing. The warning device must be operative at all times.

(15) A limit stop, which will prevent the lift arms from over-traveling, must be installed on electric powered log unloaders.

(16) Shear guards must be installed on unloading machines and similar equipment on which the arms pivot and move alongside the operator creating a pinch point at that location.

(17) All forklift log handling machines must be equipped with a grapple arms and the arms must be used whenever logs are being carried.

(18) When log trucks are loaded by a log stacker and the lay of any log is higher than the stakes, the log stacker must remain against the completed load, or other suitable protection provided, to prevent the logs from falling until at least two wrappers and binders have been applied.

(19) All binders and wrappers must remain on the load until an approved safeguard has been provided to prevent logs from rolling off the side of the truck or trailer when binders are released. A shear log, or equivalent means, must be provided to ensure the log truck will be stationed close enough to the wrapper rack so that a log cannot fall between the log truck and the wrapper rack when removing binders

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and wrappers. At least one binder must remain secured while relocating or tightening other binders. Crotch lines, forklifts, log stackers, log unloaders, or other effective means must be used for this purpose.

(20) An extra wrapper or metal band of equal strength must be placed to hold the logs when it is necessary to remove a wrapper to prevent it from being fouled by the unloading machine.

(21) Machines with arms that block the regular exit when in the up position must have an emergency exit installed.

(22) Riding on any part of a log handling machine except under the canopy guard is prohibited.

(23) Identification tags must not be applied or pulled unless logs are resting in a stationary place, such as bunks, cradles, skids, or sorting tables.

(24) Employees must not approach the immediate vicinity of a forklift-type log handling machine without first notifying the operator of the person's intention and receiving an acknowledgement from the operator.

(25) When dry land log dumps use unloading methods similar to those of water dumps, the safety standards for water dumps apply.

(26) When logs are handled between sunset and sunrise or other periods of poor visibility, the employer must provide illumination that meets the requirements of WAC 296-62-09003 relating to illumination.

(27) Air operated stake releases must meet the following requirements:

(a) The air supply must be taken from the "wet" air reservoir or from the accessory air line to a spring loaded, normally closed control valve;

(b) The control valve must be located in the cab, positioned so that it is accessible only from the operator's position;

(c) The control valve must be fitted with a spring-loaded cover or otherwise guarded against inadvertent operation; and

(d) A separate air line must extend from the control valve to the tractor and trailer stake release chambers. The air line must be clearly identified or installed so that it cannot be mistaken for the service or emergency air line.

(28) Each deck must be constructed and located so it is stable and provides each employee with enough room to safely move and work in the area.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59340, filed 8/18/99, effective 12/1/99.]

WAC 296-54-595 Transporting crews.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-595, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-595, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-595, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-595, filed 9/21/79.]

WAC 296-54-59510 Speeders used to transport crews. (1) All speeders must be equipped with two separate and independently operated braking systems, either of which

must be of sufficient capacity to lock all wheels when speeder is fully loaded;

(2) All speeders used for transporting crews must be equipped with methods for sanding tracks, operative for both directions of travel.

(3) Electric lights of sufficient candle power and range so that vehicle can be stopped within the range of the beam, and which will shine in the direction of travel, must be provided on all speeders.

(4) Adequate tail lights must be installed and maintained in good order.

(5) Automatic windshield wipers of sufficient capacity to maintain clear visibility must be installed on all speeders.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59510, filed 8/18/99, effective 12/1/99.]

WAC 296-54-59520 Trailers used to transport crews.

(1) When trailers are coupled behind speeders, they must be equipped with two separate and independent braking systems, either must be of sufficient capacity to lock all wheels when the trailer is fully loaded. One of these must be power operated and must be controlled from the speeder; the other manually operated from the trailer. One person must be designated to operate this brake in case of emergency.

(2) All trailers must be coupled to speeders with metal couplings and safety chains or straps of sufficient strength to withstand the impact caused by a broken coupling.

(3) No trailer shall coast or be used as a crew car without being attached to a speeder.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59520, filed 8/18/99, effective 12/1/99.]

WAC 296-54-597 Railroads.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-597, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-597, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-597, filed 9/21/79.]

WAC 296-54-59710 Railroad construction and maintenance. (1) All construction must be according to safe logging practices as to size of rails, ties, track accessories and methods of installing same.

(2) Rail guards must be placed on main lines and spurs, consistent with the type of traffic and general local conditions.

(3) Rail anchors of approved design must be installed wherever practicable.

(4) Frogs, switches, and guard rail ends must have either patent or wooden foot guard blocking installed.

(5) Slip plates must be used under all switches and switch points.

(6) All above ground wire for permanent telegraph or telephone lines used for dispatching must be well strung on insulators and must be clear of the ground and obstructions.

(7) Where telephone lines are strung under or near power lines, foot stools mounted on insulators in front of telephone boxes must be used, unless other protection is provided, which affords a substantially equivalent measure of safety.

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(8) Foundations, pile trestles, framed bent trestles, mud sills, or other framework of all structures must be adequate to support the maximum imposed loads without exceeding the maximum safe working unit stresses.

(a) The structure must be maintained in good condition and repair.

(b) The structure must be inspected at least annually by a qualified person.

(c) The employer must maintain records of the inspections and make the records available to the department on request.

(9) Outside wooden guard rails must be installed on all railroad bridges except that outside wooden rails will not be required where inside steel guard rails are used;

(a) They must extend not less than six inches above the top of the ties and must be bolted or spiked to ties at intervals of not more than five feet; and

(b) Spacer blocks must be used unless ties are spiked to stringers, or guard rails are dapped to avoid need for spacer blocks.

(10) Guard rails must extend at least six inches above the top of the ties and are bolted or spiked to ties at maximum intervals of five feet. Spacer blocks must be used unless ties are spiked to stringers, or guard rails are dapped to avoid need for spacer blocks.

(11) Regular bridge ties of not less than ten feet in length must be used on all railroad bridges constructed after the effective date of these standards.

(12) Trestles and bridges longer than two hundred fifty feet must have safety platforms with safe standing space for two persons installed. The platforms must be spaced so that a person on the trestle or bridge is never more than one hundred twenty-five feet from a safety platform or the end of the bridge or structure.

(13) All railroad bridges and trestles used regularly as footways must have a plank walkway between the rails that is at least twelve inches wide and two inches thick. The walkway must extend from end to end of the bridge or trestle.

(14) A suitable substantial walkway at least three feet wide with handrail must be installed on bridges or trestles where train crews must perform routine inspection or repair work on trains. Substantial platforms and handrails must be provided where switches are located on bridges or trestles. Adequate clearance must be allowed for the throw of the switch.

(15) All dangerous trees, snags or brush must be cleared a safe distance from both sides of the track. Any obstruction that will create a transportation hazard must be removed.

(16) Material must be provided that will promote secure footing at places alongside the track where employees customarily perform duties, such as inspecting loads, setting brakes by hand, or throwing switches.

(17) The distance between any main tracks and a side track must allow a clearance of four feet between bunk ends and locomotive cabs.

(18) The following clearances must be maintained:

(a) At least eight feet horizontal clearance on each side of the center line of standard gauge mainline railroads; and

(b) At least twenty-two feet vertical clearance above the top of each rail (according to standard railroad engineering practices).

(19) Derailers must be installed as follows:

(a) Derailers must be installed and used on all landings, passing tracks, and spurs where cars are left on a grade.

(b) Derailers must be close to standing equipment.

(c) The operation of a derailer must not create a hazard to buildings and other railroad lines.

(d) Derailers must not be installed on the inside rail on a sharp curve.

(e) Derail signs must be set on both sides of the track even with the derailer.

(f) An unneeded derailer must be removed or rendered inoperative.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59710, filed 8/18/99, effective 12/1/99.]

WAC 296-54-59720 Railroad operations. (1) Employees must report accidents, detention of trains or speeders, failure in supply of fuel or water, defects in track, bridges, or signals to the supervisor by the quickest possible method.

(2) Any logging railroad may maintain a special set of operating rules applicable to their logging operation, provided that said rules are acceptable to the department of labor and industries.

(3) Each logging railroad operation with more than one piece of railroad equipment in operation, must have a dispatcher on duty. All equipment must receive clearance from the dispatcher.

(4) Train crew size must be based on the number of persons needed to safely operate the train under all prevailing conditions. When necessary to set hand brakes, two or more persons must be assigned to set the brakes and to give signals.

(5) All locomotives must be equipped with sanding devices for both rails, front and rear, in proper working order. Clean, dry sand should be used.

(6) Locomotives must be equipped with power brakes (air or steam) on all driving wheels. Tenders must also have power brakes.

(7) All locomotives and speeders, operating between sunset and sunrise or other periods of reduced visibility, must be equipped with and use head lights that shine in the direction of travel. The lights must be bright enough so the train can be stopped within range of the light beam. Cab lights must be provided and maintained so the operators can see from their required positions the gauges and equipment necessary for operation.

(8) All locomotives must be equipped with proper grab irons, hand holds, steps, and running boards.

(9) All locomotives must be equipped with automatic couplers, suitable for low or high draw-bars.

(10) On all rolling stock, wheels with sharp or badly worn flanges, must be replaced. Avoid using flat wheels.

(11) All locomotives with tender must have an apron of proper length and width to ensure safety. The apron must be roughened to ensure secure footing.

(12) Handholds and footboards must be provided on locomotive cranes, except where the cab overhangs the end of the car.

(13) Trains and speeders must not exceed a safe speed.

(14) The trainmen must test the air brakes before leaving the terminal. Enginemen must not proceed until they are satisfied by brake action that the brakes are able to control the train.

(15) All of the cars in a train must have brakes in good operating condition.

(16) On railroads where joint logging operations of two or more firms are necessary, trains must be dispatched at least fifteen minutes apart. Red lights must be displayed on the rear of such trains at night or when visibility is poor.

(17) Whenever cars are left on grades, derailleurs must be provided. Derail signs must be placed near derailleurs. In setting out equipment, care must be used in seeing that proper clearance is provided.

(18) Standard pressure for mountain grades requires a pressure of ninety pounds in train pipe, one hundred ten pounds in main reservoirs (low pressure) and one hundred thirty pounds in high pressure to ensure quick releasing of brakes and recharging of auxiliaries. Engineer must see that the engine carries these pressures and that sanders, both forward and rear, are in working order. On all heavy grades the high pressure retaining valve must be used and before train is started from landing, a test of brakes must be made and piston travel adjusted, if necessary, and retaining valves put up. Engineer must start train away from landing slowly, giving wheels a chance to roll before applying brakes and, to avoid skidding of wheels, using sand freely. Brakes should then be applied immediately and released, allowing the retaining valves to hold the train while train pipe and auxiliaries are being recharged. Train speed should be held to the required rate by setting and releasing brakes as it is necessary to control train.

(19) When necessary to leave loads on a pass while switching a side, loads must be left close to the derailer, air set and enough hand brakes set up, before cutting the engine from the train.

(20) The engineer must see the car or signal person when making couplings, giving the train crew enough time to align drawheads and open knuckles of coupler, especially on curves, except when using radios.

(21) Drawbars should not be aligned with the foot while cars or engines are in motion. The train crew must not climb between cars while in motion. Engineers must not drift too close to switches that are to be thrown. The position of switch points should always be observed after throwing switch. The switch lever should be pushed firmly into the notch before leaving the switch. No persons except trainmen, unless authorized, shall ride on engine footboards. Throwing objects from the train or engine while in motion is prohibited. A bell must be rung or whistle blown before moving the locomotive.

(22) Equipment must not be pushed ahead of a locomotive unless a brake tender is on the head car in constant view of the engineer or second brake tender in a position to receive and pass the signal to the engineer.

(23) In addition to air brakes, hand brakes must be provided on all cars and maintained in good working order.

(24) Hand brakes must be easily accessible to brake tenders when cars are loaded. When wheels or staff brakes are used they should be placed on the side opposite the brow log

at the dump to prevent their damage when cars are unloaded. All switch throws, walkways, and cleared areas for brake tenders must be on the hand brake side.

(25) All brake hickies must be made from three-fourths inch hexagon steel (high grade) and be twenty-four inches with a good claw on one end to fit the wheel and a knob on opposite end to prevent slipping from the brakeman's hand.

(26) All railroad trucks and cars, where brakes are set by hand while in motion, must have good footboards and toeboards on the brake end.

(27) A ten-inch bunk block is recommended on all trucks to prevent logs from slipping over block.

(28) All cars other than logging trucks must have hand hold and foot steps to permit employees to get on and off easily and safely.

(29) All cars and trucks regularly operated must have automatic couplers.

(30) Locomotives and cabooses must carry the following equipment:

- 1 red light (lantern type)
- 3 red flags
- At least 3 fuses

(31) When a train stops between telephones, or where the rear of a train extends beyond yard limits, the rear of the train must be properly protected.

(32) A whistle sign board must be placed one thousand two hundred feet from each side of highway crossings.

(33) A rail clamp must be placed to hold cars left on a grade on main line or spurs.

(34) All cars and trucks must be legibly numbered so that those with defects may be reported and taken out of service. Each locomotive, speeder, or other self-propelled vehicles must be numbered, or otherwise made readily identifiable.

(35) All cars used for hauling logs must be equipped with patent stake bunks, or bunks with chock blocks and/or chains, constructed so that the block can be released from the opposite end of the bunk unless solid stakes are used.

(36) All main line trains of more than ten loaded cars must have a caboose at the rear of the train.

(37) All logging operations having both truck roads and railroads must post signs at intersections same as public crossings.

(38) The following engine whistle signals are established as standard and are taken from the American Association of Railroads. The signals prescribed are illustrated by "o" for short sounds and "-" for long sounds. Audible whistle must be sounded when approaching camps, junctions, grade crossings and other prescribed places as required by the American Association of Railroads:

One short	(o) Stop, apply brakes.
Two long	(--) Release brakes.
Three long	(---) When running, train parted, to be repeated until answered by hand signal.
Two short	(oo) Answer to any signals not otherwise provided for.
Three short	(ooo) When train is standing back.
Four short	(oooo) Call for signals.
Two long, two short	(--oo) Approaching highway crossing at grade.

One long	(-) Approaching station, rollway, chute, crossing, junctions, and derailleurs. When standing, air leak.
Six long	(-----) Repeated at intervals, call for section crew, train derailed.
One long, three short	(-ooo) Flagger to go back and protect rear of train.
Four long	(----) Foreman.
Five long	(-----) Flagger to return from any direction.
Long, short	(-o-o-o) Repeated four or more times, fire alarm.
Seven long, two short	(-----oo) Repeated, person hurt.
One long, one short	(-o) Repeated at intervals, closing down.
Groups of shorts repeated	(ooooooo) Danger of runaway.
Unnecessary use of whistle is prohibited.	

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59720, filed 8/18/99, effective 12/1/99.]

WAC 296-54-59730 Railroad maintenance—Loading or unloading. (1) Whenever track gangs, bridge crews, etc., work on railroads that are in use, the following signal systems must be implemented:

(a) A yellow caution flag by day and a yellow lantern by night is placed far enough in each direction from the crew to protect them against approaching equipment. The operator of approaching equipment must acknowledge the signal by two short blasts of the whistle or horn and proceed with caution.

(b) When crews are removing or replacing a rail or performing any other work that would make it necessary for approaching equipment to come to a stop, a red flag during daytime work and a red lantern during nighttime work is placed in the center of the track far enough in each direction from employees to protect them against approaching equipment. The operator of approaching equipment must:

(i) Acknowledge the signal by one short blast of the whistle or horn;

(ii) Come to a dead stop; and

(iii) Remain standing until the signal is removed by the person who placed it, or until investigation proves that the track is safe for passage.

(c) The employer may choose to use a flagger in place of meeting the above requirements.

(2) Where clearance is scant, warning signs or signals must be posted.

(3) Switch throws should be kept well oiled and targets and signs in good legible condition.

(4) Standard clearances must be maintained at all points on the right of way. However, if clearance is necessarily restricted in loading or unloading areas or at water tanks, fuel tanks, etc., then warning signs must be posted at these locations.

(5) The employer must provide adequate safeguards to protect employees performing the following tasks:

- Repairing railroad equipment;
- Working on or in railroad equipment;

- Loading or unloading cars; or
- Performing other duties where there is danger of the railroad equipment being struck by other moving railroad equipment.

(a) A derail must be used to prevent other rail equipment from contacting such cars or equipment or endangering employees. After cars are spotted, blue flags must be placed in the center of the tracks at least fifty feet from the end car during the day and blue lights must be installed at such locations at night.

(b) Flags, lanterns, or derails must be removed only by the person placing them unless they are to remain posted for a longer period of time. In which case one person on each oncoming shift must determine that they are in place and they must not remove the safeguards until certain that all employees are in the clear.

(c) Operators of approaching equipment must not pass or remove a flag or lantern that is properly posted. Cars or other equipment must not be placed where they will obscure the signal from an operator controlling approaching equipment.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-59730, filed 8/18/99, effective 12/1/99.]

WAC 296-54-601 Signals and signal systems. (1) Standard hand or whistle signals as described in this chapter must be used for the movement of rigging, logs, or equipment when using a high lead, slackline, or cable skidder system for yarding. For hand signal illustrations, see appendix 1.

(2) Voice communication may be used to move rigging and control movement of logs, provided a standard audible whistle signal is sounded before any line is moved.

Note: Subsections (1) and (2) of this section do not apply to grapple or other special yarding systems where employees are not exposed to the movement of logs or rigging.

(3) Voice communications may be used for grapple yarding under the following conditions:

(a) Voice communications by use of radio frequencies may be used to transmit instructions and directions to the yarder operator when using a grapple type logging system, if no employee is in a hazardous area near live rigging.

(b) Voice communication may be used to instruct the yarder operator when picking up an occasional log with the use of a choker on a grapple system, if the grapple is on the ground before the setting of the choker and no lines are moved by the operator until the person setting the choker has returned to a safe location away from any running lines. When a number of logs must be yarded by using chokers instead of the grapple, the requirements for high lead logging apply.

(4) Voice communication on the same radio frequencies used to transmit skyline, high-lead, slackline or skidder whistle signals (154.57 and 154.60 MHz channels), must be limited to reporting injuries, fire, and emergency situations where special tools or precautions are needed to prevent or alleviate a hazardous situation. In addition:

(a) The rigging crew must call the yarder engineer by name to ensure that proper contact is established;

(b) The yarder engineer must acknowledge the call with a whistle "stop" signal before the caller starts transmitting the voice message;

(c) Voice transmission must be kept as brief and to the point as possible; and

(d) After receiving the voice message, the yarder engineer must again acknowledge with a whistle "stop" signal that the message has been received and is clearly understood.

(5) If a standard signal is not listed for an unusual or new situation, a hand or whistle signal other than any listed for the type of yarding being done may be used for the specific situation only. Any special signals developed must be understood by all persons working in the area who may be affected by their use.

(6) A copy of the standard hand and whistle signals must be posted on the yarder and at places where crews congregate. For tractor logging operations, hand signals must be posted at places frequented by the crew members such as in crew buses, etc.

(7) Only one person in any crew shall give signals at the point where chokers are being set. Any person is authorized to give a stop signal when someone is in danger or another emergency condition is apparent.

(8) Hand signals are permitted only when the signal person is in plain sight of the machine operator and when visibility allows signals to be seen. Hand signals may be used at any time as an emergency stop signal.

(9) Throwing of any type of material or relying on engine noise, such as from a chain saw, as a signal is prohibited.

(10) All persons must be in the clear before any signal is given to move the rigging, logs, or turns. Rigging, logs, or turns must not be moved until after the proper signals have been given.

(11) Machine operators must not move any line unless the signal received is clear and distinct. If in doubt, the operator must repeat the signal as understood and wait for confirmation.

(12) A horn or whistle that is automatically activated by the radio or electric signaling system must be used on each yarder used for skyline, high lead, skidder or slackline system of yarding, except where hand signals or voice communication as described in subsection (2) of this section is permitted. The horn or whistle must emit a sound that is clearly audible to all persons in the affected area and must be sounded before any line is moved. Such a horn or whistle is also required on combination yarding and loading machines and tree pullers. Audible signals are not necessary on grapple or other yarding systems where persons are not exposed to the movement of logs or rigging.

(13) All radio-controlled motorized carriages and sky-cars must have a warning horn which must be sounded before any lines or loads are moved or an audible whistle must be sounded from the yarder.

(14) Each unit of the signal or control system in use must be tested daily before logging operations begin. Audible signals used for test purposes must not include signals used for the movement of lines or materials.

(15) Citizen band (CB) radios must not be used to activate any signal, machine, or process, either automatically or by voice. CB radios may be used for communication between sides, vehicles, work units, or for emergency situations.

(16) When audible whistle signals are being used simultaneously by yarding and loading machines at a landing, signal whistle or horn tones used in connection with machine movements must be so differentiated as to distinctively identify any intended work movement of either machine.

(17) When the normal crew configuration consists of two or more persons at the point where chokers are being set, they must each carry an operable transmitter on their person. Only one transmitter is required if:

(a) The signal person has no other duties and remains in an area where there are no hazards created by the moving rigging or logs; or

(b) The rigging crew is comprised of only one employee.

(18) The use of a jerk wire whistle system for any type of yarding operation is prohibited.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-601, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-601, filed 10/28/96, effective 1/1/97. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-11-057 (Order 80-15), § 296-54-601, filed 8/20/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-601, filed 9/21/79.]

WAC 296-54-603 Electric signal systems. (1) Where an electrical signal system is used, all wires, attachments, and connections must be weatherproof.

(2) Electric signal systems must be properly installed and adjusted. They must be protected against accidental signaling and must be maintained in good operating condition at all times. Enough signal wire must be provided to enable good voice contact between the whistle punk and rigging crew at all times.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-603, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-603, filed 9/21/79.]

WAC 296-54-604 Radio signaling permits. To apply for a new radio signaling permit, to request a change in a permit, or to request a change in the use area for any permitted system, write to:

WISHA Services Division—Permits
Department of Labor & Industries
P.O. Box 44650
Olympia, WA 98504-4650

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-604, filed 8/18/99, effective 12/1/99.]

WAC 296-54-605 Radio systems used for voice communication, activation of audible signals, or control of equipment. (1) A valid operating permit must be obtained by the owner from the department of labor and industries, prior to putting into use any radio signaling or control system intended to be used in conjunction with any type of cable logging operations.

(a) Permits will be issued only for systems licensed for such use and using those carrier frequencies as authorized by the Federal Communications Commission.

(b) Permits will be granted only when tone or function frequencies are compatible with other radio systems in use

and when in compliance with all other applicable requirements of this chapter.

(2) The department of labor and industries reserves the right to designate the use of radio frequencies for specific purposes or functions. For example: Frequencies may be specified for voice transmission of instruction, others for tone-coded functions, or activation of signaling devices.

(a) Single tone coded functions must not be used on radio equipment designed to initiate whistle signals, or to activate or control any machine, material-handling device, or other equipment hazardous to employees.

(b) The department may also designate which tone frequencies may be used for the activation of a signaling device or for control of equipment on certain federal communication assigned carrier frequencies.

(3) A list of tone frequencies that may be used with any Federal Communications Commission assigned carrier frequencies will be made available from the department upon request.

(4) The department will assign the area or areas in which a radio signaling system may be used and mark those areas on the permit. Radio signaling systems must not be used in any area other than the ones indicated on the permit. (See Figure 36: Areas for Use of Radio Signaling Systems for Logging Operations.)

(5) The person or firm name on the permit must be the same as the person or firm operating the radio signaling system except for loaner or rental sets. A person or firm using a loaner or rental set is responsible for the radio signal system as if they were the owner of the set.

(6) The application for a permit to use a radio signaling system must contain the following information (see Figure 37: Application for permit to operate radio signal system in designated area):

(a) Name and address of applicant.

(b) The radio frequencies of the radio signaling device in MHz.

(c) The tone frequencies of the radio signaling system used to activate a horn, whistle, or control equipment in Hz. The security gate, or pulse tone, must be shown first.

(d) The name of the manufacturer of the radio signaling system.

(e) The serial number of the receiving unit.

(f) The state assigned area or location in which the unit will operate.

(g) The type of signaling used.

(h) From whom the system was purchased or acquired, and the date of acquisition of the system.

(i) Intended use and function of the system.

(7) All radio equipment must meet all applicable FCC standards. FCC identifier numbers and required information must be visible when possible.

(8) Radio equipment must not be used without displaying a permit as required by this standard. The permit must be prominently displayed on the outside case of the receiver of the unit or, for radio-controlled carriages, on the transmitter in the yarder.

(9) Each radio receiver must have its radio carrier frequency in MHz and tone frequency(s) in Hz indicated on the outside case of the receiver (see Figure 38: Radio permit):

(a) The manufacturer's name and serial number must be permanently indicated on the outside of the case;

(b) When the duration or width of the tone frequencies performs a function, the one duration/width must also be permanently indicated on the outside of the receiver case;

(c) Each transmitter must be identified with its receiver; and

(d) Two or more receivers in operation simultaneously on the same tone frequencies are prohibited unless one is used for monitoring only.

(10) It shall be the responsibility of the owner of any radio signaling system to notify the department of labor and industries, immediately, if the signal system is:

(a) Permanently retired (in what manner and date retired);

(b) Sold (submit name and address of purchaser and date sold);

(c) Removed from the state (name of state to which moved and date moved); or

(d) Stolen (date).

(11) All radio signaling systems put into use for the first time after the effective date of these safety standards, shall meet or exceed the minimum performance specifications contained in WAC 296-54-607 of these safety standards, and, when altered or repaired, shall continue to meet such specifications.

(12) Adjustments, repairs, or alterations of radio signaling and control devices must be done only by or under the immediate supervision and responsibility of a qualified and certified radio technician with factory training or equivalent certified experience. Anyone without the technical ability or the proper equipment to cause the signaling systems to function within required tolerances must not attempt to repair, alter, or adjust the systems.

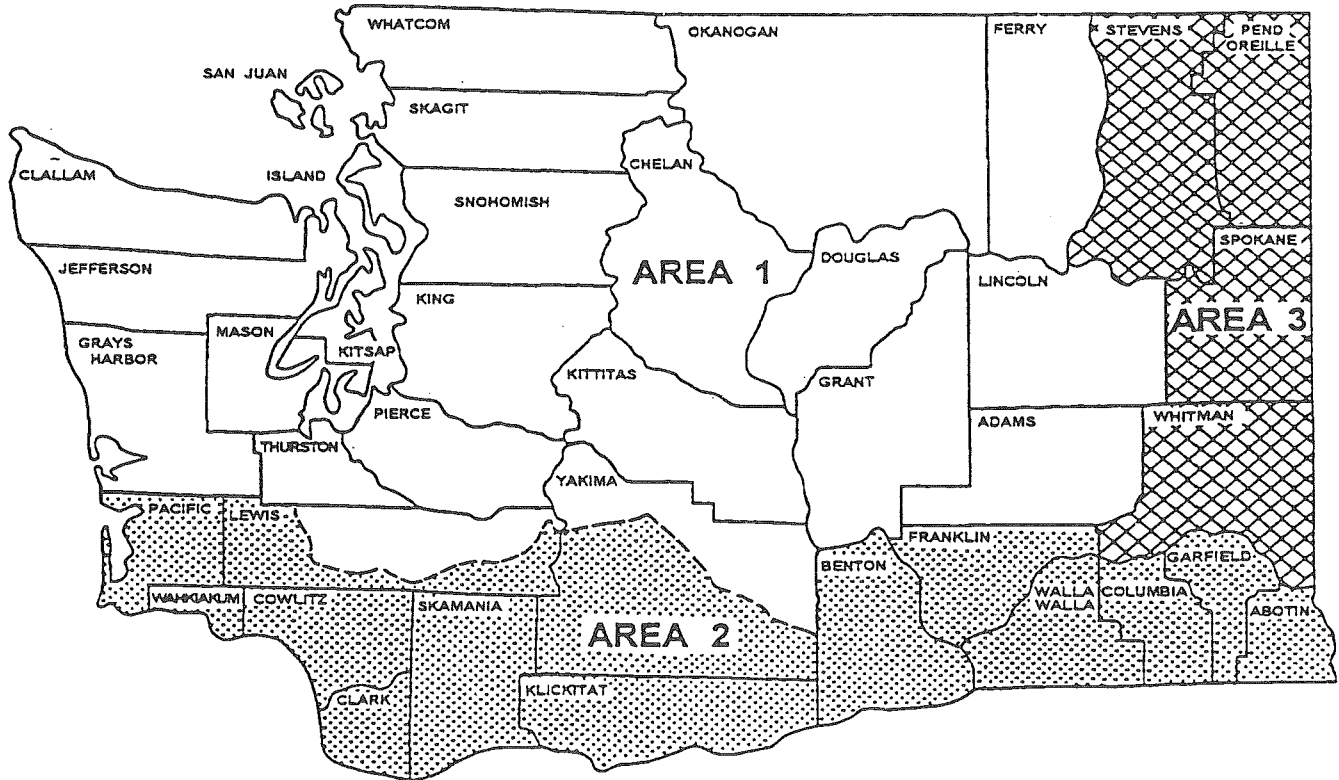
(13) When interference, overlap, fadeout, or blackout of radio signals is encountered, the use of the device must be discontinued immediately. Use may not be resumed until the source of trouble has been detected and corrected.

(14) Radio frequencies assigned to systems for which voice communications may be used to give signals to the yarder operator must not be the same frequencies as those assigned for whistle signals or machine control signals used in skyline, highlead, slackline, or cable skidder systems.

(15) When hazardous interference is created by moving a voice communication system into an area where a system is already in use on the same frequency, use of the newly-moved system must be immediately discontinued until the problem of interference has been corrected.

(16) Before moving any unit from one assigned geographical area to another (see area map, Figure 36: Areas for Use of Radio Signaling Systems for Logging Operations), the owner must apply for and receive a new permit from the department.

AREAS FOR USE OF RADIO SIGNALING SYSTEMS FOR LOGGING OPERATIONS



STATE OF WASHINGTON
DEPARTMENT OF LABOR AND INDUSTRIES
DIVISION OF INDUSTRIAL SAFETY AND HEALTH

Figure 36: Areas for Use of Radio Signaling Systems for Logging Operations

Form No. 157.

STATE OF WASHINGTON

5-71

DEPARTMENT OF LABOR AND INDUSTRIES

DIVISION OF SAFETY

APPLICATION FOR PERMIT
TO OPERATE RADIO SIGNAL SYSTEM IN DESIGNATED AREA

Radio Carrier Frequency Serial No.
 Tone Coding Frequency Hz Name of Manufacturer of
 Signal System
 Firm Name Address By.....
 Intended Function of Unit: Voice communication Whistle signal Control Equipment
 Area in which Unit will be Operated: 1 2 3
 (Area map included in Safety Standards for Logging Operations)
 Type of Tone: Sequential Simultaneous If other specify type
 System to be Used For: Grapple Skyline, Highlead, Slackline, Skidder Balloon
 System Purchased or Acquired From
 Date System Purchased or Acquired: Day Month Year
 Mail Permit to
 Date Application Mailed to Division of Safety/...../.....
 Day Mo. Year

Date Permit Issued/...../.....
	Day Mo. Year
DIV. OF SAFETY USE ONLY	

Figure 37: Application for Permit to Operate Radio Signal System in Designated Area

Dept. of Labor & Industries
 Div. of Consultation & Compliance
 P.O. Box 44650
 Olympia, WA. 98504-4650



RADIO
PERMIT

TO OPERATE MULTI-TONE RADIO SIGNAL SYSTEM IN
DESIGNATED AREA.

MODEL	SERIAL
CARRIER FREQUENCY	MHz
TONES	Hz
AREA	
FIRM NAME	
ISSUED BY	

F416-086-000 RADIO PERMIT 10-88

Figure 38: Radio Permit

A permit issued by the department of labor and industries shall be attached to the outside of the receiver which shall indicate the area in which the radio signaling equipment may be used.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-605, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 96-22-013, § 296-54-605, filed 10/28/96, effective 1/1/97. Statutory Authority: Chapter 49.17 RCW.

(2001 Ed.)

88-23-054 (Order 88-25), § 296-54-605, filed 11/14/88. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-605, filed 9/21/79.]

WAC 296-54-607 Radio signal systems—Specifications and test procedures. All radio-signaling systems put into use must meet or exceed the requirements of this section. When systems are altered or repaired they must continue to meet these requirements.

(1) Radio equipment in use at cable logging sites, which is primarily used for voice communication, must be on a separately assigned frequency from radio equipment primarily used to initiate whistles or other audible signaling devices or to control any machine, material handling device or other equipment hazardous to employees.

(2) Radio-signaling systems used to transmit whistle signals or control functions of equipment associated with skyline, highlead, slackline, or cable skidder systems of logging must transmit and decode only by the use of authorized multitone frequencies. Only sequential tones may be used to transmit signals or control equipment when using carrier frequencies of 154.57 or 154.60 MHz.

(3) All radio systems receiver sensitivity must be able to attain 0.4 microvolt, or greater, for 12 dB SINAD ratio for VHF frequencies and 0.5 microvolt, or greater, for UHF frequencies. When interference is a factor, the receiver may be desensitized in the furtherance of safety by a person qualified according to WAC 296-54-605(12).

(4) All radio signal systems must have receiver spurious attenuation of at least 70 dB when measured by the 20 db qui-

[Title 296 WAC—p. 1273]

eting method and image response attenuation of 60 db when measured by the 20 db quieting method. "**Spurious response attenuation**" is a measure of the receiver's ability to discriminate between a desired signal to which it is resonant and an undesired signal at any other frequency to which it is also responsive.

(5) All radio signal systems must have receiver selectivity of at least 80 db plus or minus 30 KHz, when measured by the E.*I.A. SINAD method.

(6) The receiver-decoder tone frequency stability must not exceed 0.006 (0.6%) above or below the assigned tone frequency.

(7) The drift of a transmitter-encoder tone must not exceed 0.006 (0.6%) above or below the assigned tone frequency.

(8) Parts of the radio-signaling system affected by moisture, which may be subjected to the entrance of moisture during use, must be weatherproofed. Transmitters must be tested within fifteen minutes after being subjected to the following conditions and must have the ability to continue functioning properly. The transmitter and receiver must be placed in a humidity chamber for eight hours where the humidity has been maintained at not less than ninety percent and where a 40 degrees C. temperature has been maintained.

(9) Radio-signaling system units must operate within tolerances specified at any temperature within the range of -30 degrees C. to +60 degrees C.

(10) Switches of transmitters used to send whistle signals or activate equipment associated with high lead, slackline, or cable skidder systems of logging must be designed so that two buttons, motions or a combination of these are required simultaneously to cause activation of the system. Arrangement of the activating switches must allow the operator to transmit signals easily but not easily activate a control or command function accidentally.

(11) All receivers intended to be mounted on or in the yarder or similar equipment, and all portable transmitters, must continue to maintain specified mechanical and electrical performance during and after being subjected to vibration of the magnitude and amplitude as follows:

(a) The equipment must be vibrated with simple harmonic motion having an amplitude of 0.015" (total excursion 0.03") with the frequency varied uniformly between 10 and 30 Hz and an amplitude of 0.0075" (total excursion 0.015") with the frequency varied uniformly between 30 and 60 Hz.

(b) The entire cycle of frequencies for each group (i.e., 10 to 30 cycles and 30 to 60 cycles) must be accomplished in five minutes and repeated three times.

(c) The above motion must be applied for a total of thirty minutes in each direction, that is, the directions parallel to both axes of the base and perpendicular to the plane of the base.

(12) All portable transmitters must be able to maintain specified mechanical and electrical performance after being subjected to a shock test as follows: The transmitter shall be dropped five times from a height of four feet onto a smooth concrete floor. Each drop must impact a different surface of the transmitter.

(13) Transmitters operating on carrier frequencies of 154.57 MHz and on 154.60 MHz must be limited on maxi-

imum power output of 500 mW measured at the antenna terminals.

(14) To minimize the possibility of interference with other signaling systems, the input power of transmitters operating in the 450 MHz range should be limited to only the amount needed to transmit to the receiver of the system effectively.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-607, filed 8/18/99, effective 12/1/99. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-10-081 (Order 79-14), § 296-54-607, filed 9/21/79.]

WAC 296-54-701 Wood spar trees. (1) Wood spar trees must be of sound material of sufficient size and strength to withstand any stresses which may be imposed by any equipment used for that specific logging operation.

(2) The top of the tree must extend not more than:

(a) Sixteen feet above the top guylines on spar trees over fifty feet tall; and

(b) Eight feet above the top guylines on spar trees less than fifty feet tall.

(3) School marms used as spar trees must be topped at the forks. Spar trees, except cedar, must be barked where guylines, straps, bull blocks, and tree plates are placed.

(4) Spar trees must be topped and limbs must be cut off close so that running lines will not foul or saw on protruding knots.

(5) At least four tree plates must be placed under top guylines on spar trees over fifty feet tall. At least three tree plates must be used on spar trees less than fifty feet tall.

(6) Tree plates must be equipped with lugs or other suitable means to hold them in place.

(7) Before raising spar trees, dummy trees must be topped and guyed with three guylines equivalent in breaking strength to the mainline.

(8) When spar trees are raised, stumps used for snubbing must be properly notched. Guylines must be held by a mechanical means. Snubbing by hand is prohibited.

(9) All rub trees must be limbed and topped.

(10) Loose material such as bark, spikes, straps or chains not in use and slabs caused by bumping logs or chafing straps must be removed from the spar trees. Heavy bark must be removed from trees used for a permanent installation.

(11) A person must ride only the passline to thread lines, to lubricate blocks, or to inspect rigging.

(12) When the friction lever and passline drum are on the opposite side of the machine from the operator, an experienced person must operate the friction lever while the engineer operates the throttle. While being used, the passline drum must be properly attended by another person to guide the passline onto the passline drum with a tool suitable for the purpose.

(13) Using a gypsy drum to handle employees in the tree is prohibited.

(14) A climber's rope must encircle the tree before the climber leaves the ground, except when the climber is riding the passline.

(15) Spikes, used by the climber as a temporary aid in hanging rigging, must be removed before the tree is used for logging.

(16) Topping trees in windy weather is prohibited.

(17) Topping, rigging-up, or stripping is prohibited when visibility is impaired.

(18) When heel tackle is fastened near the machine, a safety line must be placed in such manner that in case of breakage, lines do not strike the power unit and endanger the operator.

(19) Yarding with more than one unit on any one head spar is prohibited.

(20) The angle between the power unit, the high lead block, and the mainline road must not exceed a square lead on rigged spars. When using portable spars or towers, the location of the machine or position of the operator must ensure that the operator is not endangered by incoming logs.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-701, filed 8/18/99, effective 12/1/99.]

WAC 296-54-70110 Wood spar trees—Guylines. (1)

Wood spar trees using a line greater than 7/8-inch and used as loading and yarding trees must have at least six top guys and four buckle guys, if a sail guy is used.

(2) Wood spar trees using a mainline greater than 7/8-inch and used only as yarding trees must have at least six top guys and must use at least three buckle guys.

(3) Wood spar trees using a mainline of 7/8-inch or less must be supported by at least five top guylines or other positive means of supporting the spar.

(4) Wood spar trees used for yarding with light equipment (7/8-inch or smaller mainline) must be guyed so that strains will be imposed on at least two guylines. If less than five top guys are used, guylines must be at least 1/4-inch larger than the mainline.

(5) Wood spar trees used for loading only with crotch line, spreader bar, or swinging boom must have at least four top guys and must use at least three buckle guys.

(6) More guylines must be added if there is any doubt about the stability of a spar tree, raised tree, tail tree, lift tree, or other equipment or rigging they support.

(7) Wood spar trees used for transfer must have at least five top guys and must use at least three buckle guys.

(8) Guylines must alternately be passed around the wood spar in opposite directions to prevent twisting of the spar.

(9) Guylines must be attached to the upper portion of the wood spar by shackles.

(10) When a high lead block is hung below buckle guys, at least three top guys of equal strength to the mainline must be used to keep the top from swaying.

(11) When buckle guys are required, they must be installed on the tree where they will provide the maximum effectiveness.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-70110, filed 8/18/99, effective 12/1/99.]

WAC 296-54-70120 Wood spar trees—Passlines. All spar trees must be equipped with passlines that are:

(1) At least 5/16-inch and a maximum of 1/2-inch in diameter;

(2) Not subjected to sawing on other lines or rigging, and are kept clear of all moving lines and rigging;

(2001 Ed.)

(3) A continuous length and in good condition with no splices, knots, molles, or eye-to-eye splices between the ends; and

(4) Long enough to provide three wraps on the drum before the climber leaves the ground.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-70120, filed 8/18/99, effective 12/1/99.]

WAC 296-54-70130 Wood spar trees—Straps. (1)

Safety straps of appropriate size must be placed on all high lead blocks; and other blocks whenever practicable. Safety straps must be shackled (with the closed end of the shackle up) to a guyline that extends as near as possible at right angles with the power unit, but must not be on a guyline with an extension within one hundred feet of the tree. When the top guyline on which the safety strap of the high lead block is fastened is changed, the safety strap must be attached to another guyline or the loosened guyline must be tightened after the change.

(2) All tree straps must be at least 1/4-inch larger than the pulling line. If impossible to use a safety strap, all tree straps must be 1/2-inch larger than the pulling line.

(3) Lead blocks used for yarding, swinging, loading, and unloading used in wood spars must be:

(a) Designed and constructed for this purpose;

(b) Bolted with at least two bolts through the shells below the sheaves in a manner that will retain the sheave and line in case of bearing pin failure (this does not apply to haul-back lead blocks); and

(c) Mainline blocks have a sheave diameter of at least twenty times the diameter of the mainline.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-70130, filed 8/18/99, effective 12/1/99.]

WAC 296-54-705 Truck and equipment maintenance shops. It is recognized that the usual hazards encountered in maintenance shops performing work on logging and related equipment would be very similar to those found in

general repair, machine or welding shops; therefore, the rules contained in chapter 296-24 WAC, General safety and health standards and other applicable safety standards promulgated and administered by the department of labor and industries shall apply to such places of work.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-705, filed 8/18/99, effective 12/1/99.]

WAC 296-54-707 Labor camps. Temporary labor camps for logging operations must meet the requirements of WAC 296-24-125.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-707, filed 8/18/99, effective 12/1/99.]

WAC 296-54-99002 Appendix 1—Signals.

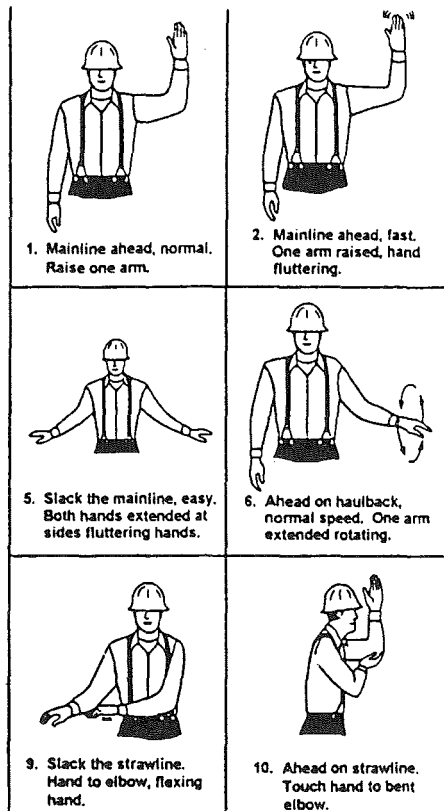


Figure 39: Standard Hand Signals

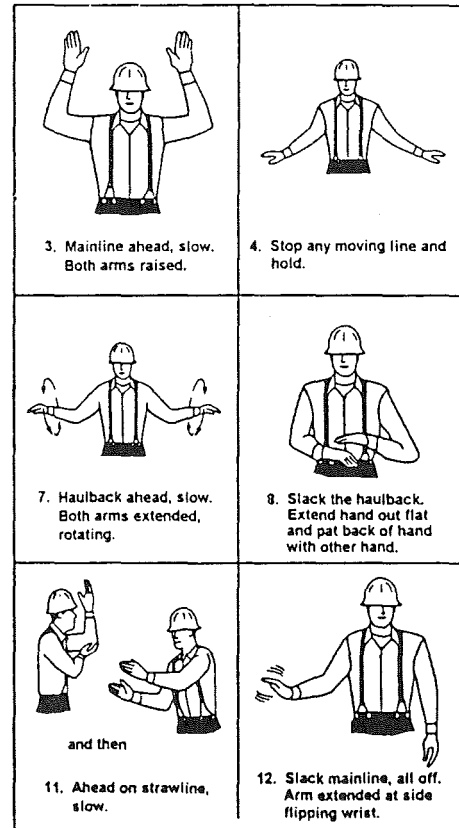


Figure 40: Standard Hand Signals

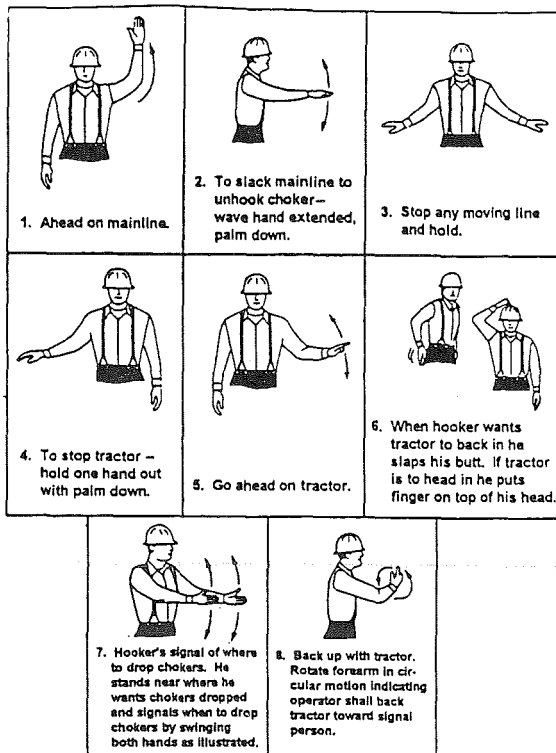


Figure 41: Standard Hand Signals

STANDARD SIGNALS FOR LOADING LOGS



Figure 42: Standard Signals for Loading Logs

HIGH LEAD LOGGING WHISTLE SIGNALS

- Means longer spacing between signals.

1 short	Stop all lines.
3 short-3 short	Ahead slow on mainline.
3 short	Ahead on mainline.
2 short	Ahead on haulback.
2 short-2 short	Ahead slow on haulback.
3 short-1 short	Ahead on strawline.
3 short-1 short-3 short	Ahead slow on strawline.
4 short or more	Slack mainline.
2 short-4 short	Slack haulback.
3 short-1 short-4 short	Slack strawline.
3 short-2 short	Standing tight line.
1 short-1 short	Tight line while lines are running, or break if running tight.
3 short	When rigging is in: Strawline back on haulback.
3 short / plus "X" number of shorts	When rigging is in: Indicates number of sections of strawline back on rigging.
3 short-1 short-2 short	Strawline back on rigging.
1 short	When rigging is in: Chaser inspect and repair rigging.
2 short	When rigging is in: No chokers back.
2 short-1 short / plus "X" number of shorts	Number of chokers back.
2 short-4 short	When rigging is in: Slack haulback-hold all lines until 2 short blown.
3 medium	Hooker.
3 medium-4 short	Hooker and that crew.
5 long	Climber.
4 long	Foreman.
1 long-1 short	Start or stop work.
7 long-2 short	Person injured, call transportation and stretcher.
1 long-1 short repeated	Fire.
Grabinski system	
2 short-1 short	Slack mainline and haulback together.
2 long	Take off or put on rider block.

SKIDDER WHISTLE SIGNALS

- Means longer spacing between signals.

1 short	Stops moving carriage-stops or goes ahead on slack puller, as case may be, if carriage is stopped.
2 short	Go ahead on skidding line holding carriage.
1 short-2 short	Pick up skidding line, easy.
2 short-1 short	Shake up carriage to clear choker.
2 short-2 short	Ahead on receding line.

SKIDDER WHISTLE SIGNALS

- Means longer spacing between signals.

3 short	Ahead on carriage, holding at present level, using interlock.
3 short-3 short	Ahead easy on skidding line.
2 short-2 short-2 short	Slack skyline, cable down.
2 short-2 short-2 short-1 short	Pick up skyline, cable up.
2 short-2 short-4 short	Slack receding line.
2 short-4 short	Slack skidding line.
2 short-2 short-1 short	Tighten all lines.
1 short-4 short	Slack off slack puller.
1 short-2 short	Pick up slack puller when slack.
2 short-2 short / plus "X" number of shorts	When carriage is in: Number of chokers wanted.
2 short-2 short-1 long	Bull choker.
1 short	When carriage is in: Inspect butt rigging.
2 short-4 short / 1 short	For each additional ten feet of tong line.
1 long / plus "X" number of shorts	Number of coils of strawline wanted.
5 medium	Tail or second rigger.
5 medium-4 short	Tail or second rigger and that crew.
2 medium	Skidder head rigger.
3 medium-4 short	Hooker and that crew.
2 long	Ahead on transfer.
2 long-4 short	Slack transfer.
1 short-3 short	Ahead on carriage with slack puller line.
1 long	Ahead on strawline.
1 long-4 short	Slack strawline.
1 long-3 short	Ahead easy on strawline.
5 long	Climber.
4 long	Foreman.
1 long-1 short	Start or stop work.
7 long-2 short	Person injured, call transportation and stretcher.
1 long-1 short repeated	Fire.

SLACKLINE WHISTLE SIGNALS

- Means longer spacing between signals.

2 short-2 short-2 short-1 short	First cable up when road has been changed and tail hold made fast.
2 short-2 short-2 short	Drop skyline.
1 short	Stop any moving line.
1 long	When logging, slack skyline.
2 short	Ahead on skyline.
1 long-2 short	Ahead easy on skyline.
3 short	Ahead on skidding line, holding haulback.
3 short-3 short	Ahead easy on skidding line with slack haulback.
4 short	Slack skidding line.

SLACKLINE WHISTLE SIGNALS

- Means longer spacing between signals.

2 short-2 short /2 short-2 short	Ahead easy on haulback with slack skidding line.
2 short-2 short	Ahead on haulback.
2 short-2 short-4 short	Slack haulback.
2 short / 3 short	Pick up skyline and skid.
2 short / 2 short-2 short	Pick up skyline and skin.
3 short-1 short	When carriage is in: Straw-line back on haulback.
3 short-1 short-2 short	When carriage is in: Straw-line back on carriage.
3 short-1 short	When strawline is out: Ahead on strawline.
3 short-2 short	Tight line.
3 short-1 short-4 short	Slack strawline.
3 short-1 short-3 short	Pull easy on strawline.
2 long	Ahead on transfer.
2 long-4 short	Slack transfer.
2 long-2 short-2 short	When carriage is in: Transfer back on carriage.
1 long / plus "X" number of shorts	When carriage is in: Number of coils.
2 short-2 short-1 short /plus "X" number of shorts	When carriage is in: Number of chokers.
1 short	When carriage is in: Inspect rigging, repair and send back.
2 short-2 short-4 short	When carriage is in: Slack haulback and hold all lines until 1 short is blown-then send back.
3 short-3 short	When carriage is in: Send back powder.
5 medium	Tail rigger.
5 medium-4 short	Tail rigger and that crew.
3 medium	Head hooker.
3 medium-4 short	Second hooker and that crew.
5 long	Climber.
4 long	Foreman.
1 long-1 short	Start or stop work.
7 long-2 short	Person injured, call transportation and stretcher.
1 long-1 short repeated	Fire.

RUNNING SKYLINE WHISTLE SIGNALS

- Means longer spacing between signals.

1 short	Stop all moving lines.
2 short	Skin carriage back.
2 short-1 short	Slack haulback.
2 short-2 short	Skin carriage easy.
2 short-3 short	Standing tight line.
1 short-2 short	Ahead on drop line.
4 short	Slack drop line.
1 short-4 short	Slack both mainlines.
1 short-1 short	Stop drop line going up and move carriage forward.
3 short	Move carriage forward.

RUNNING SKYLINE WHISTLE SIGNALS

- Means longer spacing between signals.

3 short-3 short	Move carriage forward easy.
3 short-1 short	When strawline is out: Ahead on strawline.
3 short-1 short-4 short	Slack strawline.
3 short	When carriage is in: Straw-line.
3 short-X short	When carriage is in: Number sections.
3 short-1 short-2 short	When carriage is in: Straw-line back on carriage.
2 short-X short	When carriage is in: Number of chokers.
4 short	When carriage is in: Inspect rigging, repair and send back.
1 short	When carriage is in: Hold all lines until 2 shorts, then send back.
3 medium	Head hooker.
3 medium-4 short	Hooker and that crew.
4 long	Foreman.
1 long-1 short	Start or stop work.
7 long-2 short	Person injured; call transportation and stretcher.
1 long-1 short (repeated)	Fire.
3 short-1 long	Acknowledged by engineer to signify hazardous turn.

TENSION SYSTEM SIGNALS

4	Release tension.
1 short	Stop carriage and start unspooling tong line.
1 short	Stop tong line.
1 short	Resume unspooling tong line.
1 short	Will stop any moving line or slack tong line when carriage is stopped.
2 short-2 short	Go into interlock and go back.
2 short-4 short	Slack haulback and let carriage down.
After turn is set 2 short	Go ahead on tong line.
2 short-3 short	Go ahead easy on tong line.
3 short	Go into interlock and take carriage to landing.
3 short-3 short	Ahead on carriage easy.
1 short-2 short	Increase tension on tong line when carriage is going in.
short-1 short	Decrease tension on tong line when carriage is going in.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-99002, filed 8/18/99, effective 12/1/99; Order 72-14, Figure 2 (codified as WAC 296-54-99002), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99003 Appendix 2—Sample minimum lockout/tagout procedure. (Company Name) has estab-

lished this lockout/tagout program to provide protection for employees performing maintenance or servicing of logging equipment.

Before any employee begins maintenance or servicing of equipment where the unexpected energizing, start-up, or release of stored energy could cause injury, the equipment must be shut down, isolated from all potentially hazardous energy and locked or tagged out.

Employees must not start, attempt to start, energize or use equipment that has been locked or tagged out. Tags and/or padlocks will be provided for tagging and/or locking out logging machinery and will be durable enough to withstand the environment. Tags will contain a legend such as: "Do Not Start" or "Do Not Operate." When tagout is used, tags must be located in a position that will be obvious to anyone attempting to operate the machinery. In lockout, padlocks are commonly used to prevent access to ignition/master switches or battery disconnects.

Employees performing maintenance or servicing must determine which sources of hazardous energy must be disabled for a particular job. The following are examples of hazardous stored energy found on logging equipment:

- Equipment
- Hydraulic or pneumatic pressure
- Mechanical (rotating saws, springs, shafts, gears, etc.)
- Gravity (elevated blades, booms, grapples, saw heads, etc.)

The following steps must be followed for lockout/tagout:

- Ensure that the brakes, swing locks, etc. are applied.
- Place the transmission in the manufacturer's specified park position.
- Lower or secure each moving element such as, but not limited to, blades, booms, grapples, buckets, saws, and shears to prevent a release of stored energy.
- Shut down machinery, and ensure that a responsible person removes and keeps the ignition/master key.
- Engage hydraulic safety locks when applicable.
- Before working on hydraulic or air systems, relieve pressure by bleeding tanks or lines and operate controls to dissipate residual stored energy (pressure).
- Place lockout and/or tagout device.

Before lockout or tagout devices are removed and machinery is started, inspect the work area to ensure all tools have been removed, guards are replaced, and employees are in the clear.

We will provide training to ensure that the purpose and function of the lockout/tagout program are understood by employees performing maintenance or repair of equipment.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-99003, filed 8/18/99, effective 12/1/99; Order 72-14, Figure 3 (codified as WAC 296-54-99003), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99004 Appendix 3—Industry consensus standards.

American Society of Mechanical Engineers
ASME
345 East 47th Street
New York, NY 10017
(212) 591-7000

Society of Automotive Engineers, Incorporated
SAE
400 Commonwealth Drive
Warrendale, PA 15096-0001
(412) 776-4841

American National Standards Institute
11 West 42nd Street
New York, NY 10036
(212) 642-4900

Occupational Safety and Health Administration's Office of Publications

OSHA
Room N 3101, 200 Constitution Avenue Northwest
Washington, DC 20210
(202) 219-4667

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-99004, filed 8/18/99, effective 12/1/99; Order 72-14, Figure 4 (codified as WAC 296-54-99004), filed 7/31/72, effective 9/1/72.]

WAC 296-54-99013 Appendix 4—Various types of cable logging systems.

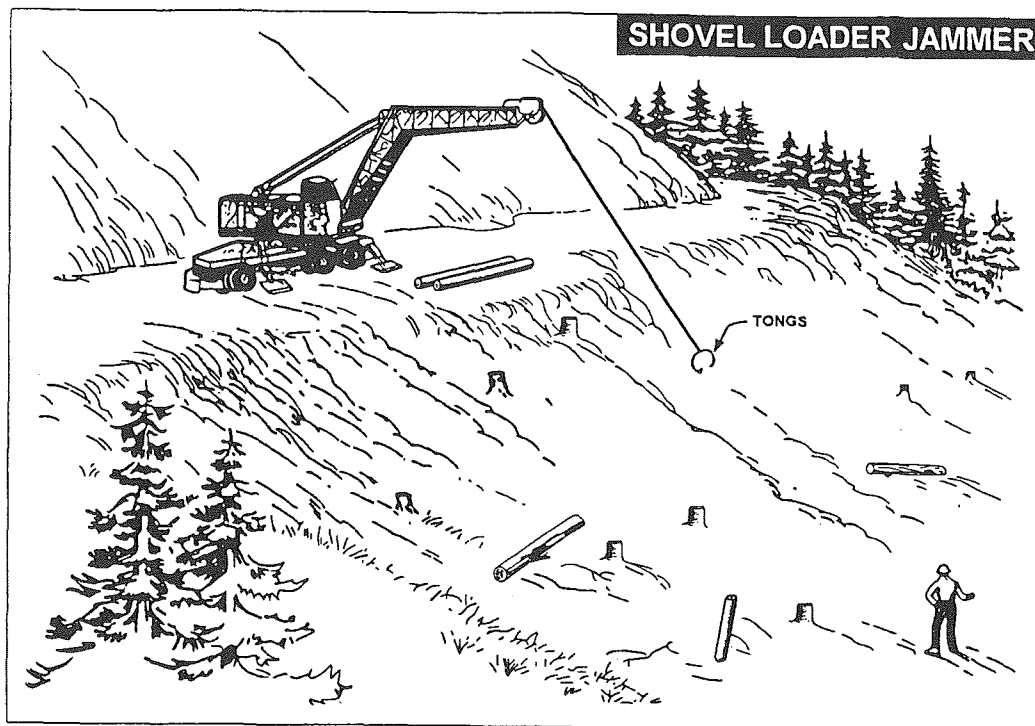


Figure 43: Shovel Load Jammer

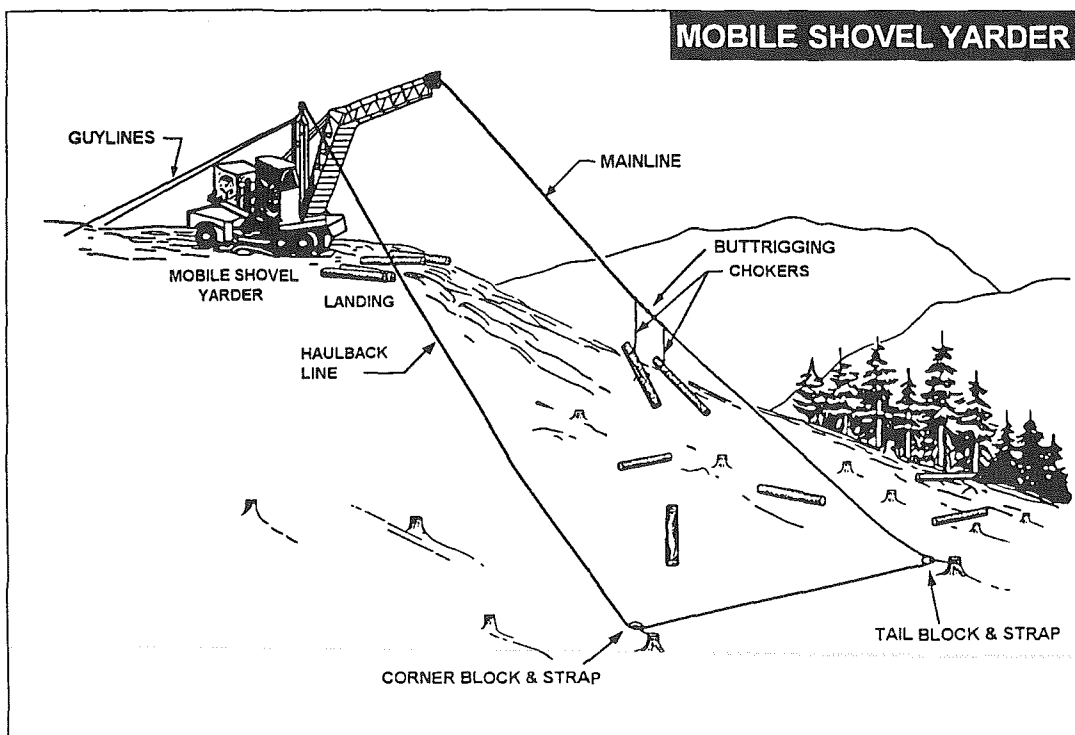


Figure 44: Mobile Shovel Yarder

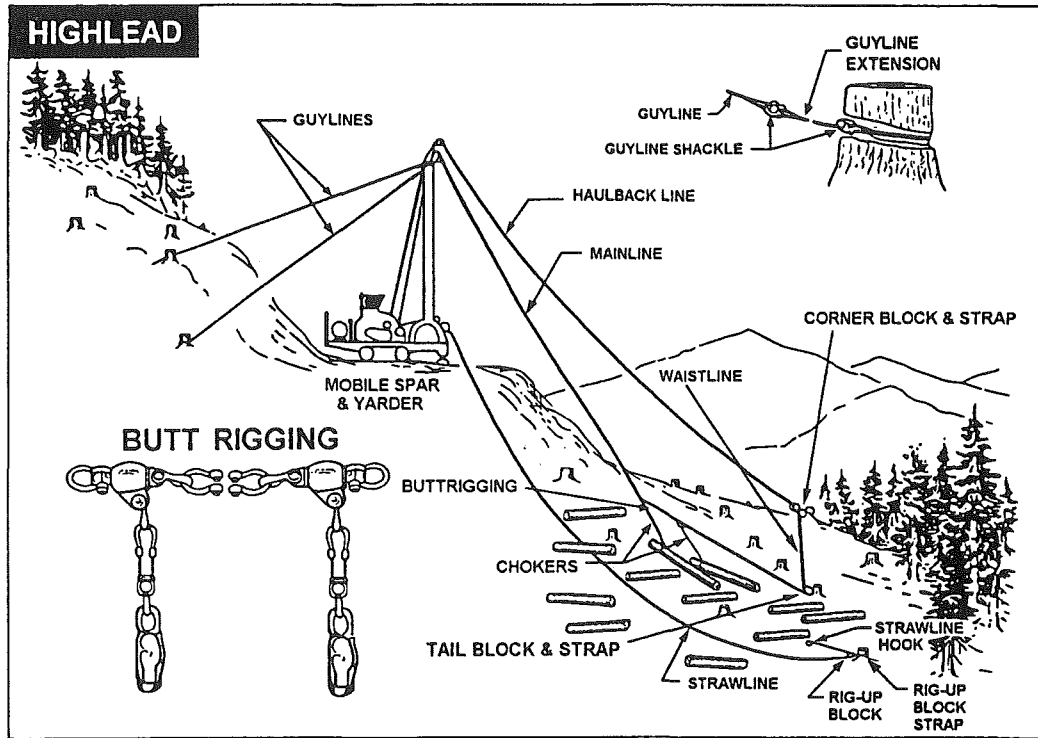


Figure 45: Highlead

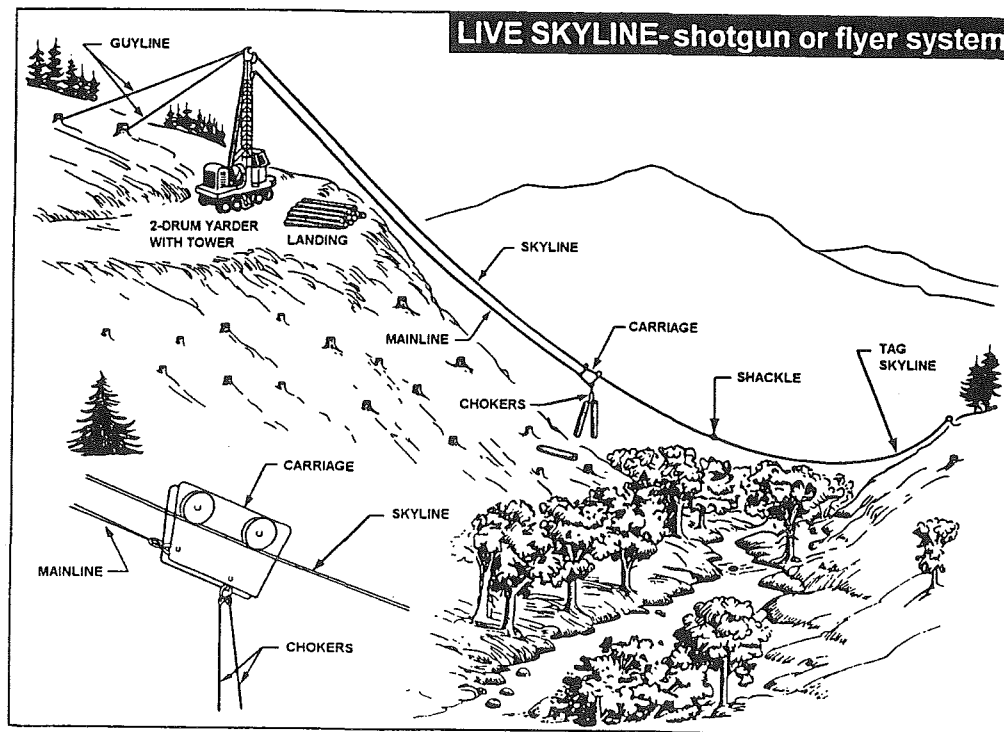


Figure 46: Live Skyline – Shotgun or Flyer System

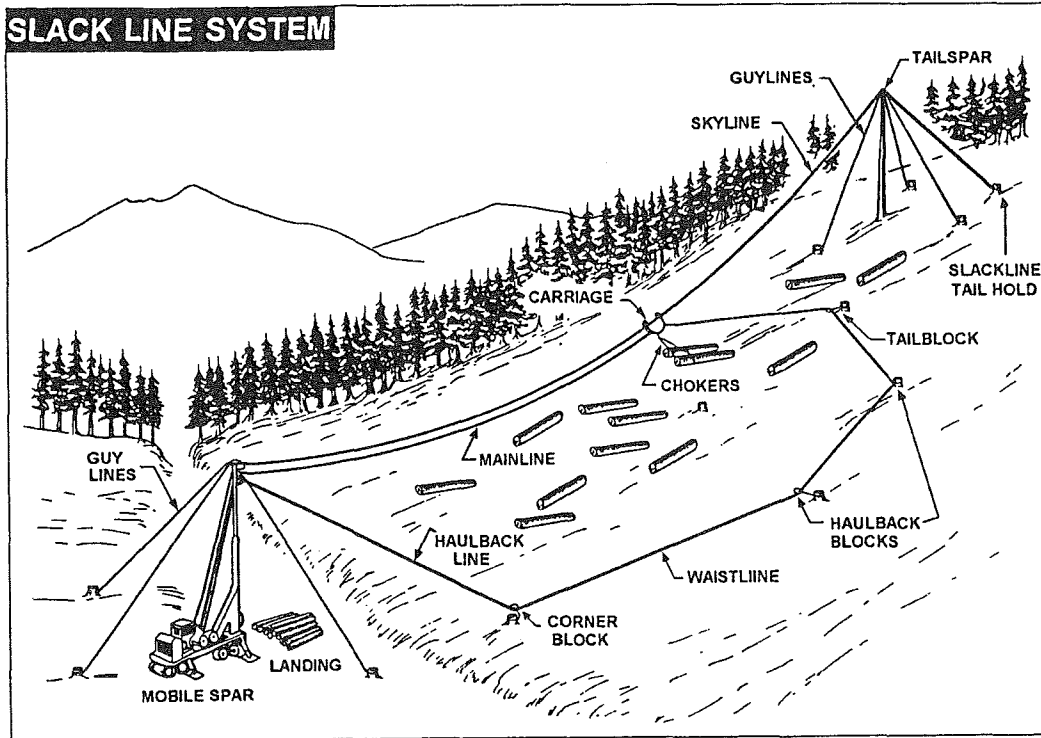


Figure 47: Slack Line System

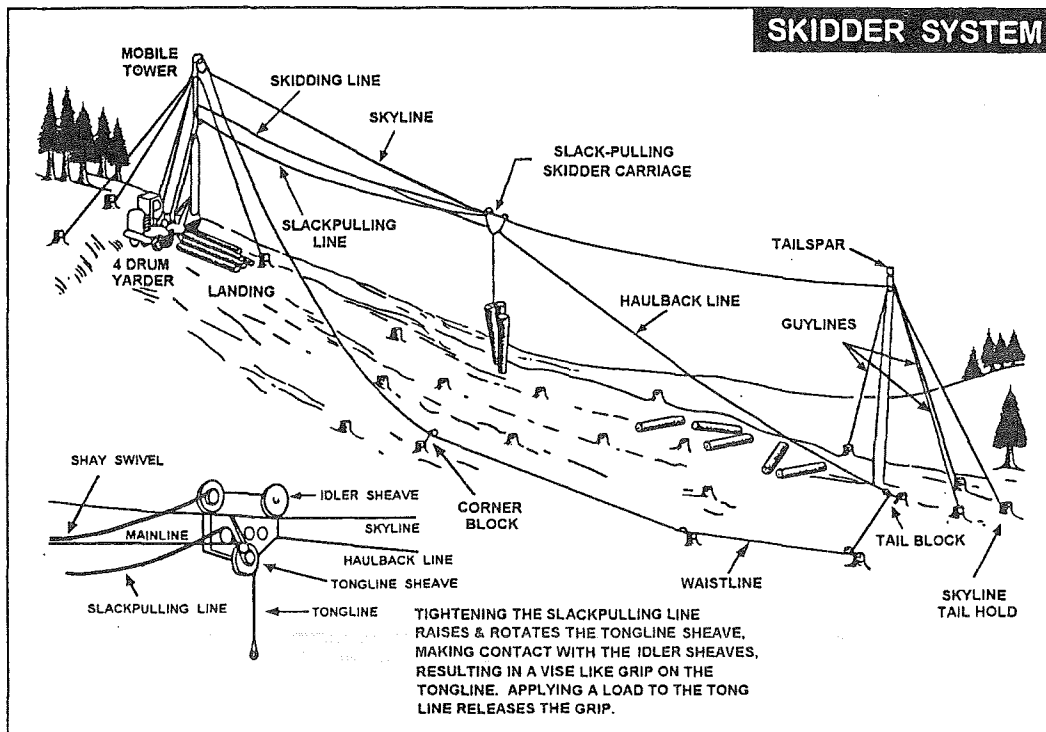


Figure 48: Skidder System

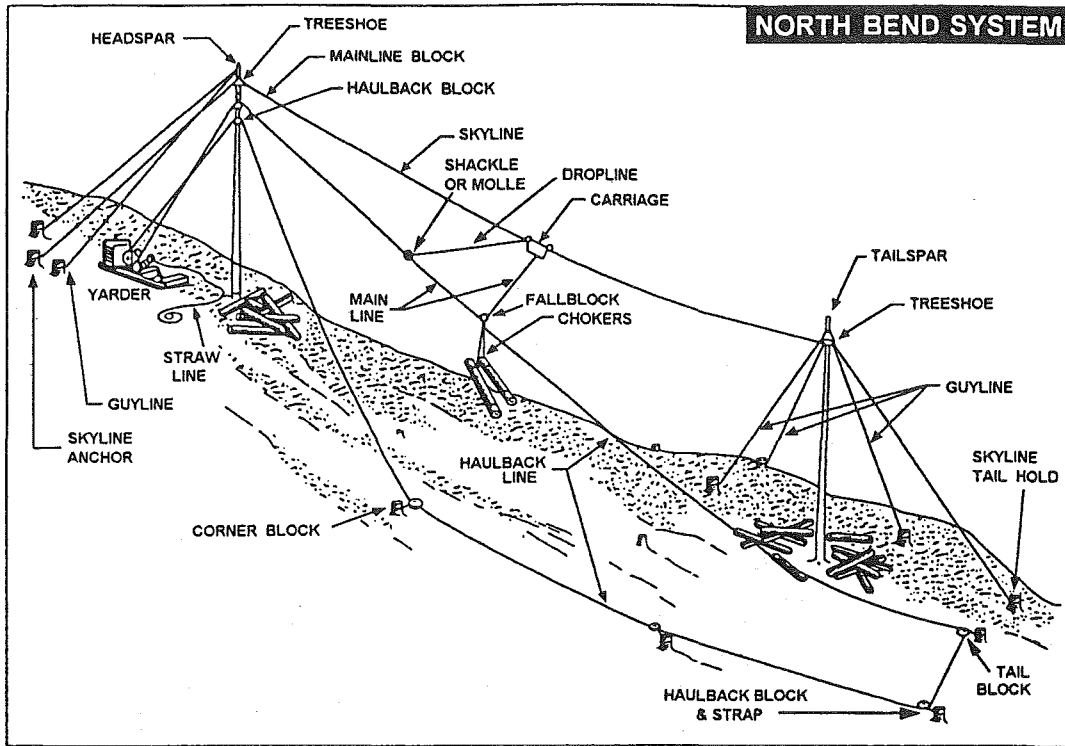


Figure 49: North Bend System

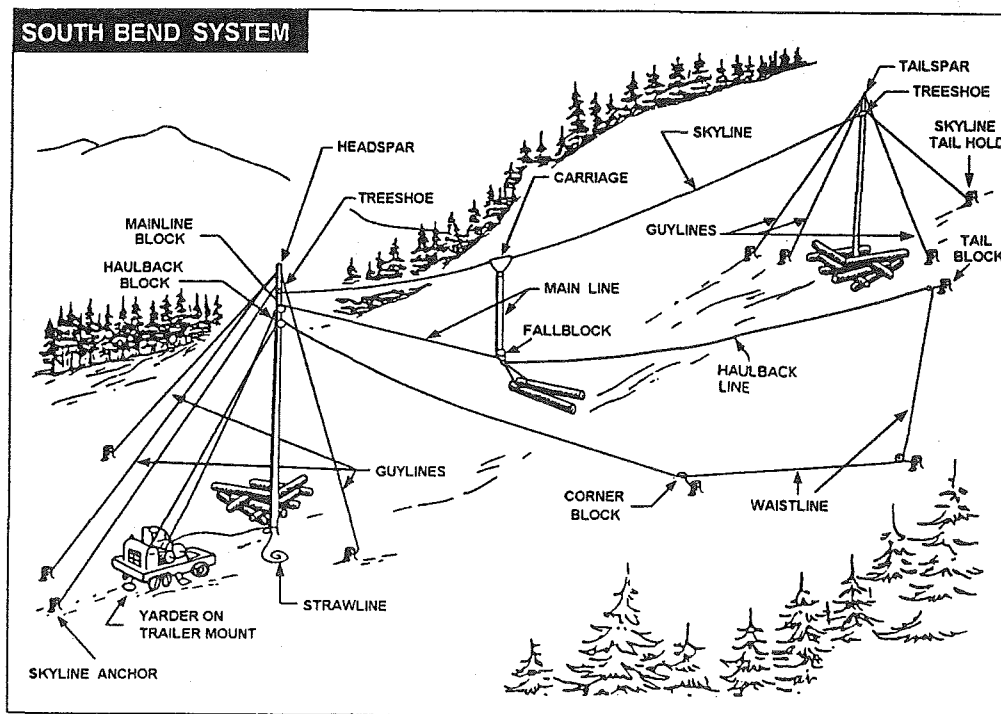


Figure 50: South Bend System

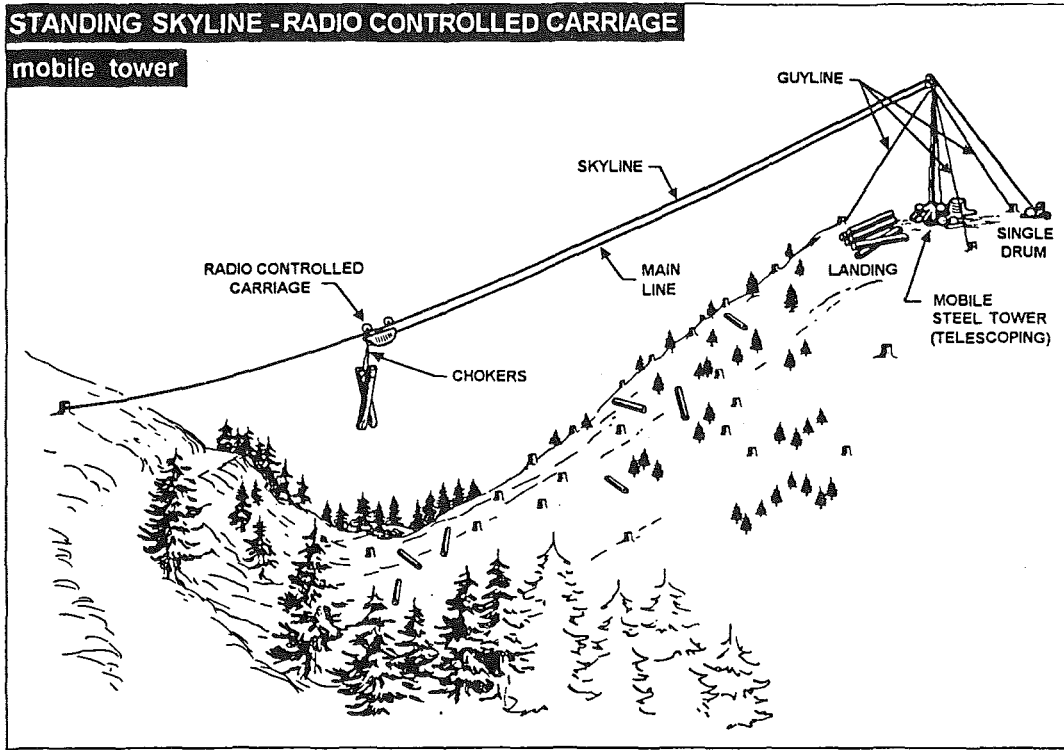


Figure 51: Standing Skyline – Radio Controlled Carriage – Mobile Tower

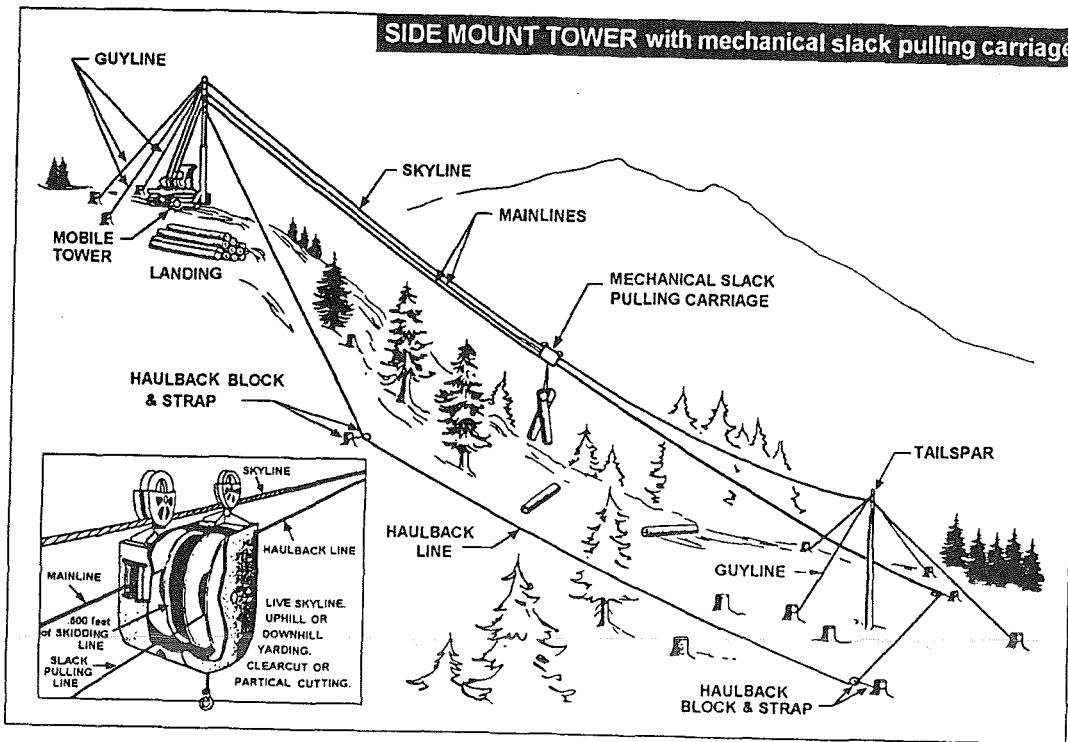


Figure 52: Side Mount Tower with Mechanical Slack Pulling Carriage

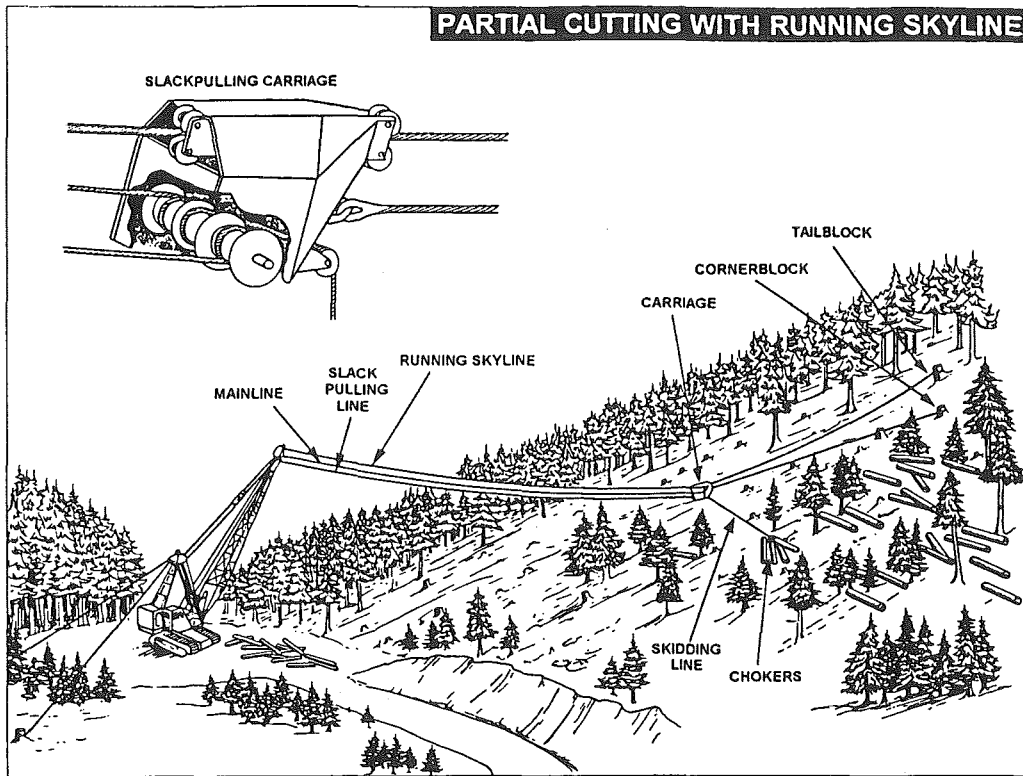


Figure 53: Partial Cutting with Running Skyline

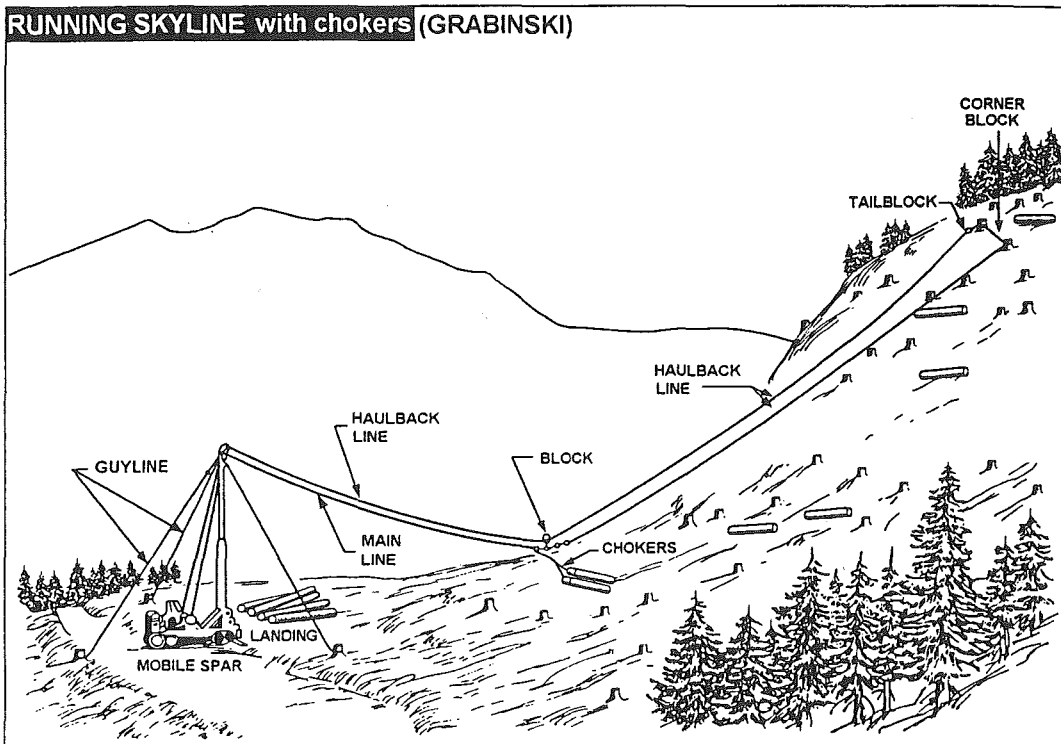


Figure 54: Running Skyline with Chokers (Grabinski)

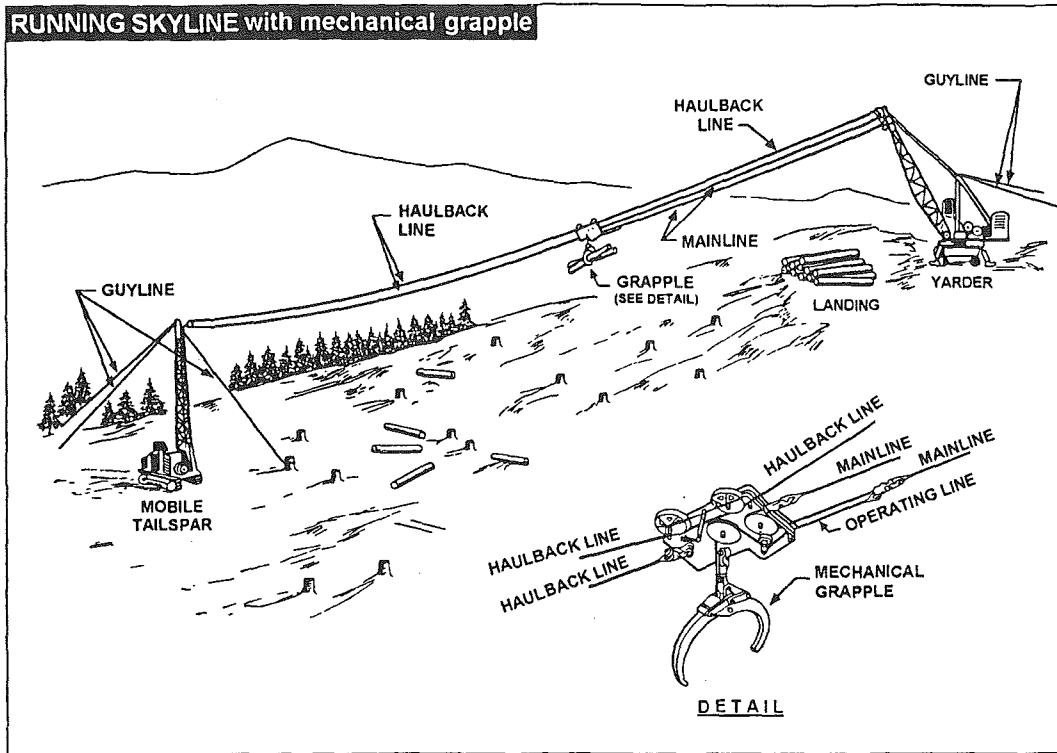


Figure 55: Running Skyline with Mechanical Grapple

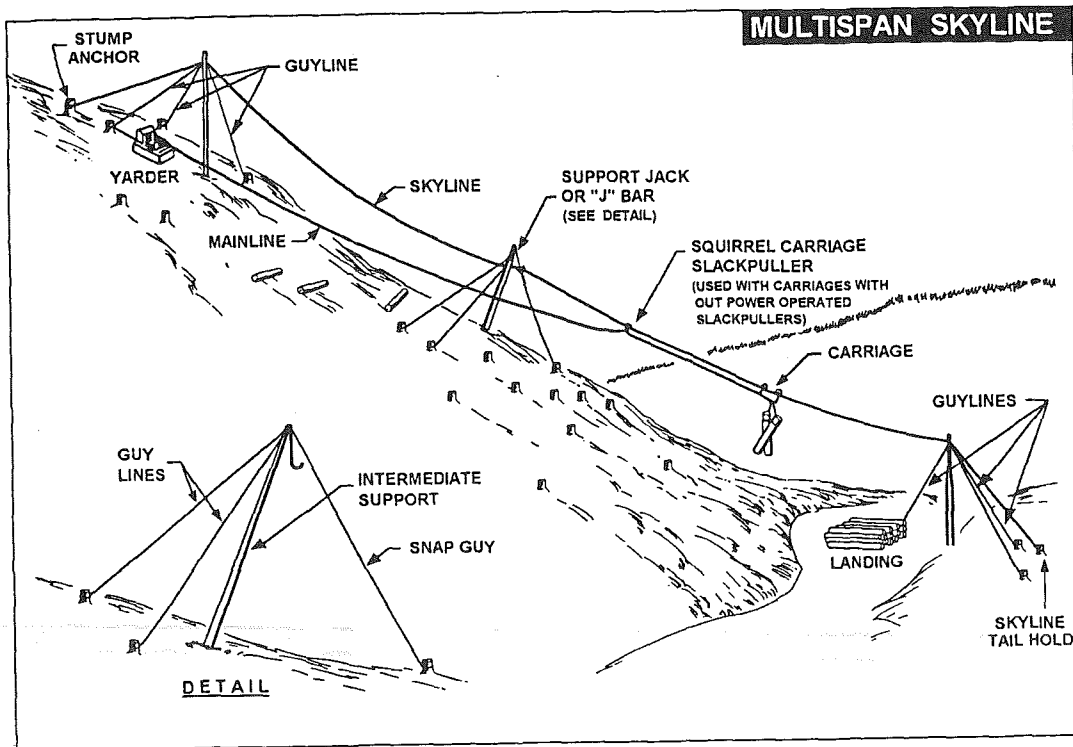


Figure 56: Multi-span Skyline

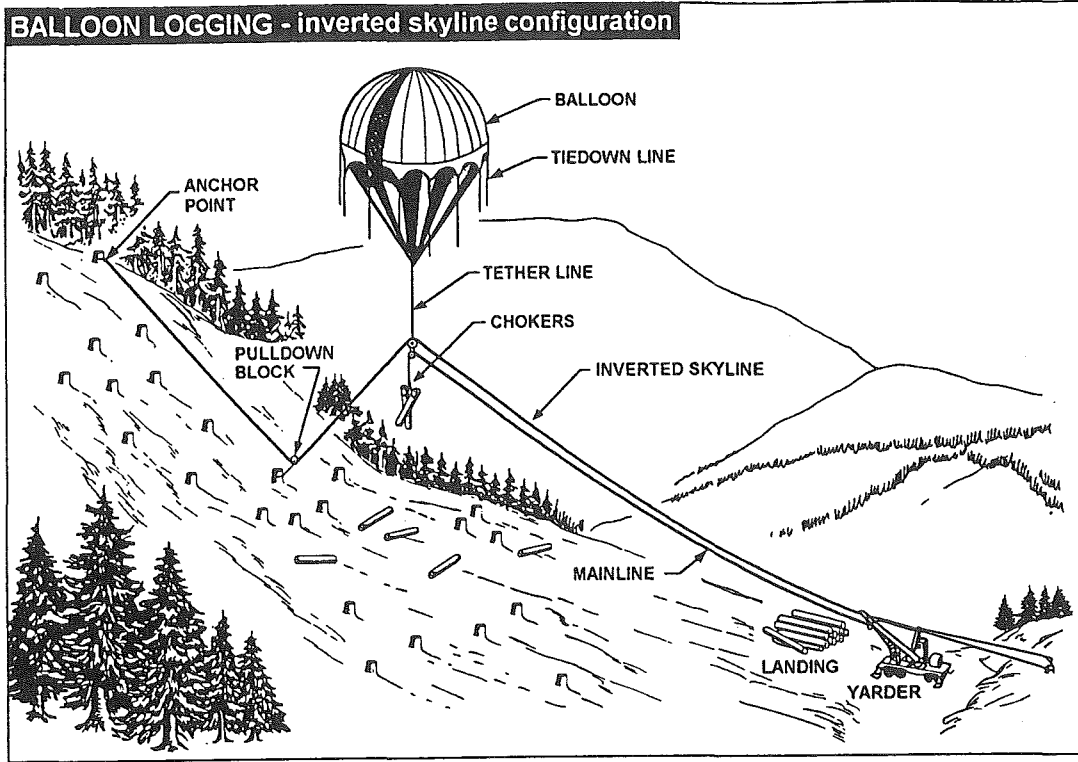


Figure 57: Balloon Logging – Inverted Skyline Configuration

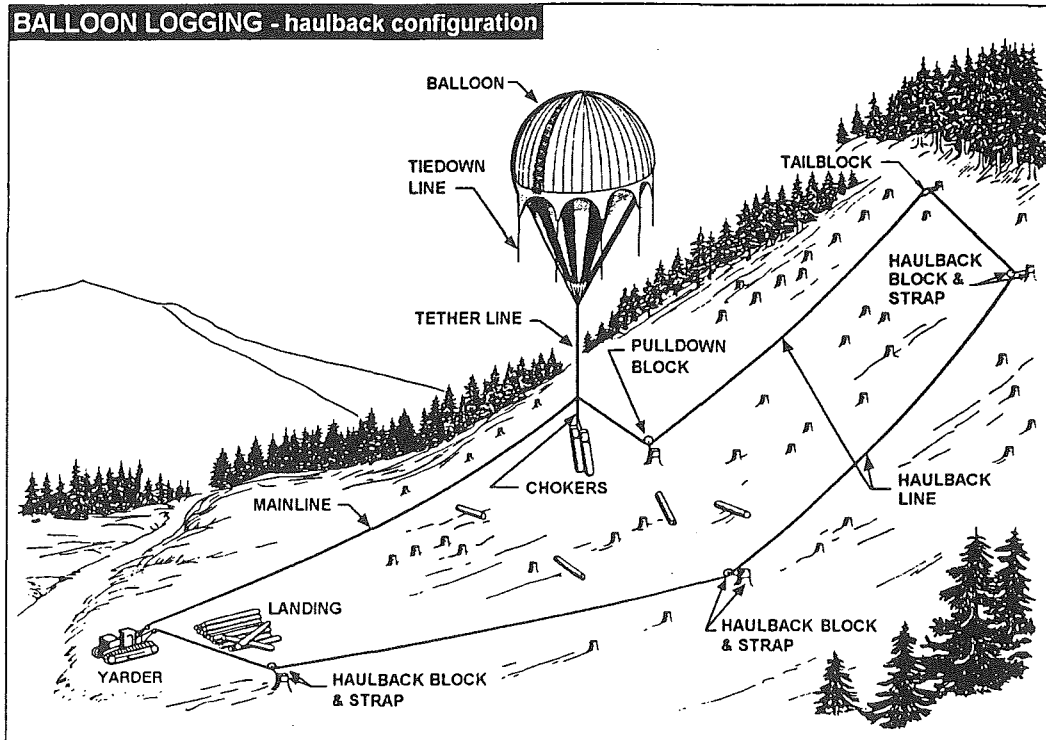


Figure 58: Balloon Logging – Haulback Configuration

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-99013, filed 8/18/99, effective 12/1/99.]

WAC 296-54-99014 Appendix 5—Wooden tree yarding and loading systems.

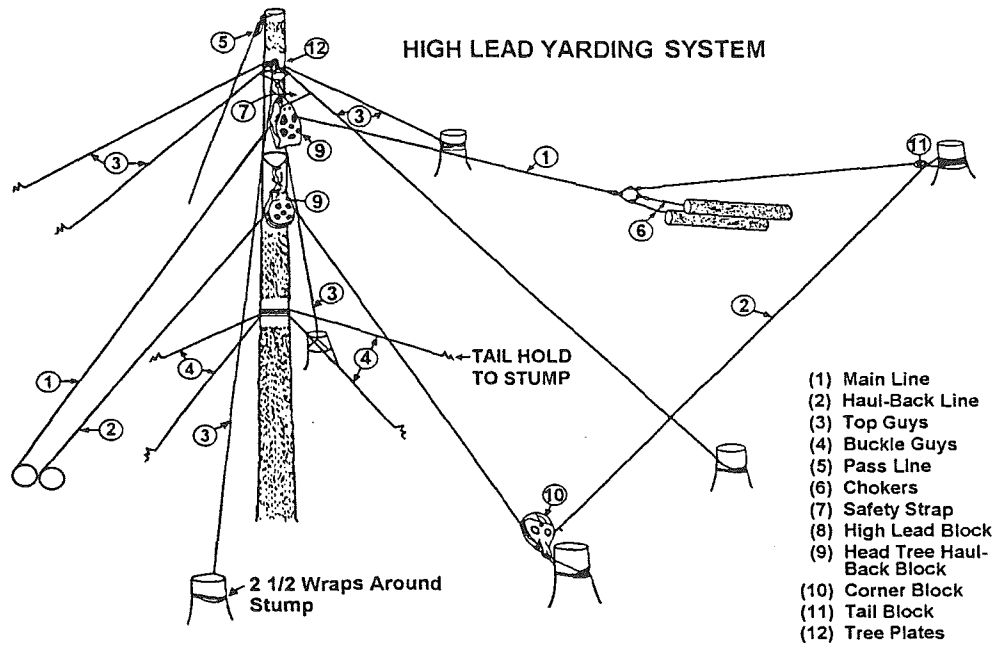


Figure 59: High Lead Yarding System

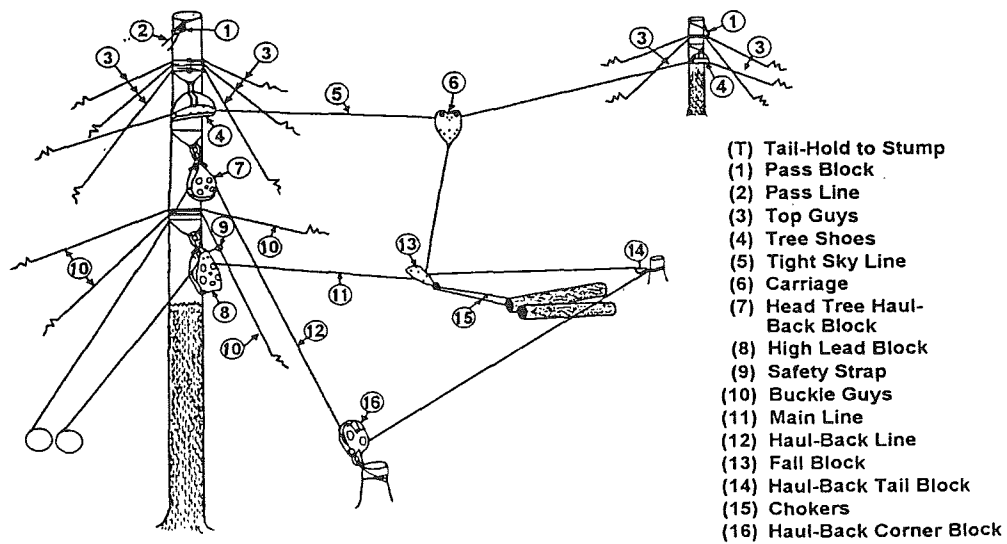


Figure 60: North Bend Yarding System

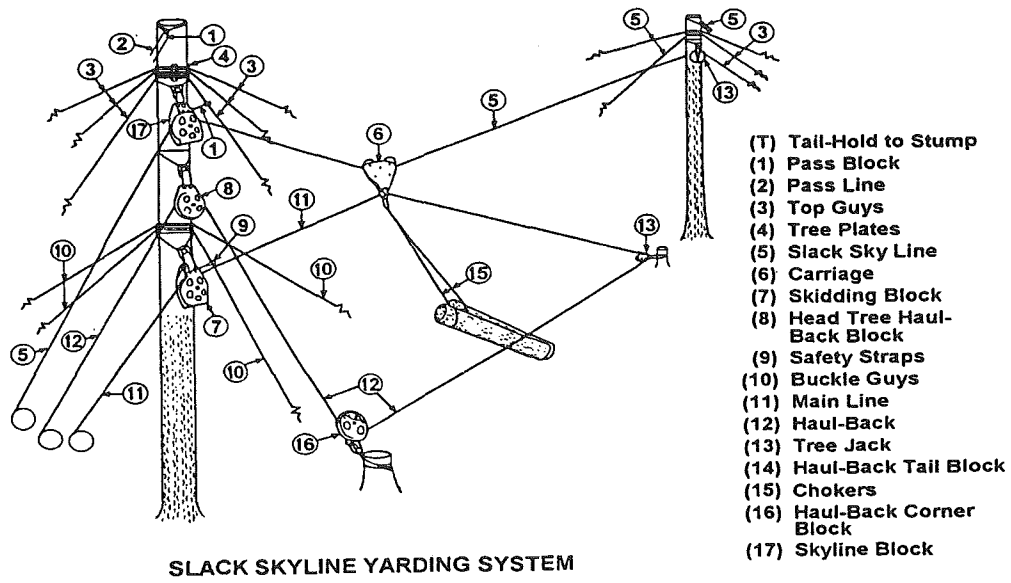


Figure 61: Slack Skyline Yarding System

Heel Boom Loading

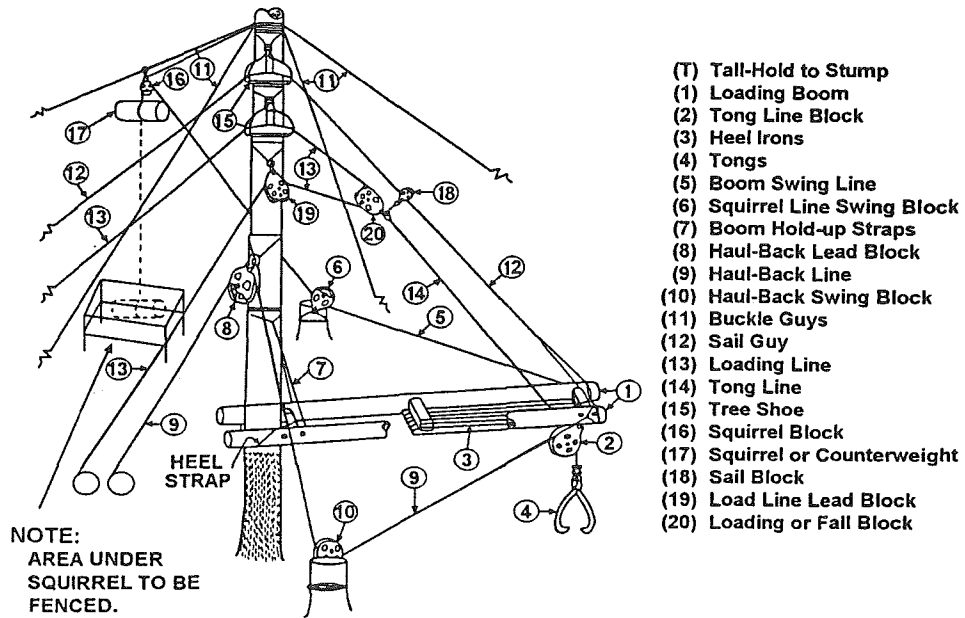


Figure 62: Heel Boom Loading

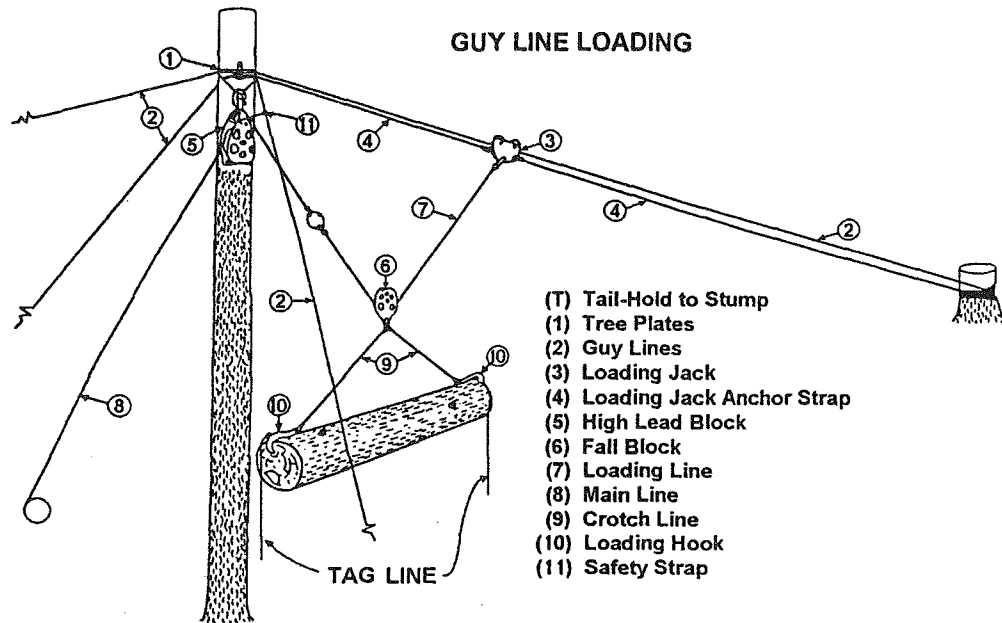


Figure 63: Guy Line Loading

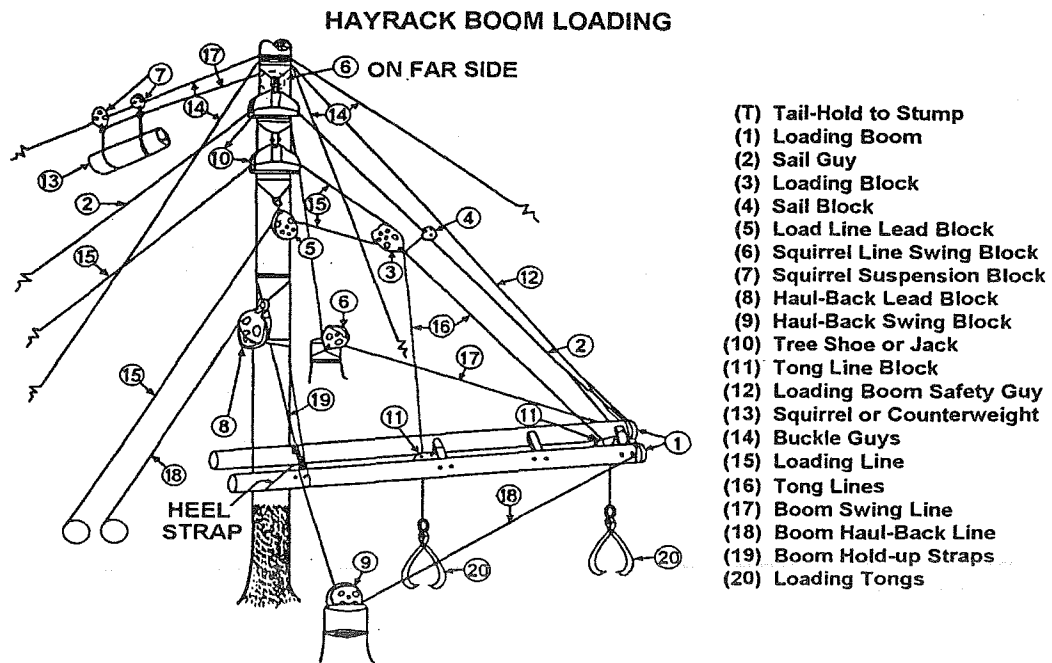


Figure 64: Hayrack Boom Loading

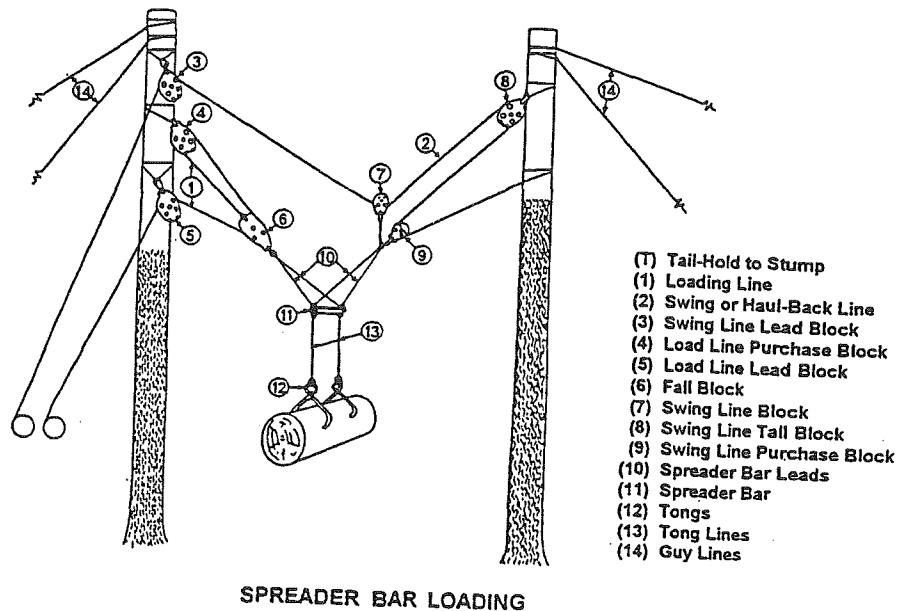


Figure 65: Spreader Bar Loading

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-117, § 296-54-99014, filed 8/18/99, effective 12/1/99.]

Chapter 296-56 WAC
SAFETY STANDARDS—LONGSHORE, STEVEDORE
AND RELATED WATERFRONT OPERATIONS

WAC

PART A—GENERAL

- 296-56-600 Marine terminals.
- 296-56-60001 Scope and applicability.
- 296-56-60003 Variance and procedure.
- 296-56-60005 Definitions.
- 296-56-60006 Personnel.
- 296-56-60007 Housekeeping.
- 296-56-60009 Accident prevention program.

PART B—WATERFRONT OPERATIONS

- 296-56-60011 Slinging.
- 296-56-60013 Stacking of cargo and pallets.
- 296-56-60015 Coopering.
- 296-56-60017 Line handling.
- 296-56-60019 Standard gauge railroad operations.
- 296-56-60021 Signals displayed by each maintenance crew.
- 296-56-60023 Warning flags or lights.
- 296-56-60025 Signals unobscured.
- 296-56-60027 Audible warning system.
- 296-56-60029 Safety observer on railroad switching.
- 296-56-60031 Warning at road crossing.
- 296-56-60033 Flying switches.
- 296-56-60035 Clearance from railroad tracks.
- 296-56-60037 Car plates.
- 296-56-60039 Dockboards (bridge plates).
- 296-56-60041 Log handling.
- 296-56-60043 Movement of barges and railcars.
- 296-56-60045 Communication.
- 296-56-60047 Open fires.

PART C—HAZARDOUS ATMOSPHERES AND MATERIALS

- 296-56-60049 Hazardous cargo.
- 296-56-60051 Handling explosives or hazardous materials.
- 296-56-60053 Hazardous atmospheres and substances.
- 296-56-60055 Carbon monoxide.
- 296-56-60057 Fumigants, pesticides, insecticides and hazardous preservatives (see also WAC 296-56-60049, 296-56-60051 and 296-56-60053).

PART E—CARGO HANDLING GEAR AND EQUIPMENT

- 296-56-60071 House falls.
- 296-56-60073 Miscellaneous auxiliary gear.
- 296-56-60075 Cargo boards and other type pallet boards.
- 296-56-60077 Powered industrial trucks.
- 296-56-60079 General rules applicable to vehicles.
- 296-56-60081 Multipiece and single-piece rim wheels.
- 296-56-60083 Cranes and derricks.
- 296-56-60085 Crane load and limit devices.
- 296-56-60087 Winches.
- 296-56-60089 Conveyors.
- 296-56-60091 Spouts, chutes, hoppers, bins, and associated equipment.
- 296-56-60093 Certification of marine terminal material handling devices.
- 296-56-60095 Advisory crane certification panel.
- 296-56-60097 Unit proof load test and inspection.
- 296-56-60098 Examination and inspection of cranes and derricks.
- 296-56-60099 Hand tools.

PART F—SPECIALIZED TERMINALS

- 296-56-60101 General.
- 296-56-60103 Terminals handling intermodal containers or roll-on roll-off operations.
- 296-56-60105 Grain elevator terminals.
- 296-56-60107 Terminal facilities handling menhaden and similar species of fish.

PART G—PERSONAL PROTECTION

- 296-56-60109 Eye protection.
- 296-56-60110 Respiratory protection.
- 296-56-60111 Head protection.
- 296-56-60113 Foot protection.
- 296-56-60115 Other protective measures.
- 296-56-60117 Maintenance and load limits.
- 296-56-60119 Protection from falling.
- 296-56-60121 Minimum safety requirements for docks and dock facilities.
- 296-56-60122 Access to vessels.
- 296-56-60123 Guarding of edges.
- 296-56-60125 Clearance heights.
- 296-56-60127 Cargo doors.
- 296-56-60129 Platforms and skids.
- 296-56-60131 Elevators and escalators.
- 296-56-60133 Manlifts.

PART H—MANLIFTS—ELECTRIC

- 296-56-60135 Manlifts—Electric.
- 296-56-60139 Hoistway enclosures and landings.

296-56-60141	Scope and application.		12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60143	Hoistway gates.		
296-56-60145	Elevator car.	296-56-410	Introduction. [Order 74-14, § 296-56-410, filed 4/22/74; Introduction, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60147	Elevator doors.		
296-56-60149	Counterweight, enclosures, and fastenings.		
296-56-60151	Guide rails.		
296-56-60153	Hoisting ropes.	296-56-412	Variance and procedure. [Order 74-14, § 296-56-412, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60155	Space under hoistway.		
296-56-60157	Car safeties.		
296-56-60159	Brakes.		
296-56-60161	Car controls and safety devices.	296-56-415	Definitions. [Order 74-14, § 296-56-415, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60167	Hoisting machine mechanisms.		
296-56-60169	Elevator car and counterweight buffers.		
296-56-60171	General requirements.	296-56-420	Education and first-aid standards. [Order 76-7, § 296-56-420, filed 3/1/76; Order 74-14, § 296-56-420, filed 4/22/74; Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
PART I—MANLIFTS—HAND POWER			
296-56-60180	Scope and application.		
296-56-60183	Hoistway landings.		
296-56-60185	Hoistway clearances.		
296-56-60187	Habitable space under hoistways.	296-56-430	Management's responsibility. [Order 74-14, § 296-56-430, filed 4/22/74; Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60189	Hoistway guide rails.		
296-56-60191	Buffer springs and overtravel of car.		
296-56-60193	Car specifications.		
296-56-60195	Counterweights.	296-56-432	Employee's responsibility. [Order 74-14, § 296-56-432, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60197	Sheaves.		
296-56-60199	Hoisting ropes.		
296-56-60201	Operating rope.		
296-56-60203	Lighting.	296-56-435	Accident prevention program. [Order 74-14, § 296-56-435, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60205	Overhead supports.		
296-56-60207	General requirements.		
PART J—LADDERS, STAIRWAYS OPENINGS, SANITATION, SIGNS, ETC.			
296-56-60209	Fixed ladders.		
296-56-60211	Portable ladders.		
296-56-60213	Jacob's ladders.		
296-56-60215	Fixed stairways.	296-56-43801	Eye protection. [Order 74-14, § 296-56-43801, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60217	Spiral stairways.		
296-56-60219	Employee exits.		
296-56-60221	Illumination.		
296-56-60223	Passage between levels and across openings.	296-56-43803	Respiratory protection. [Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-56-43803, filed 11/30/83; Order 74-14, § 296-56-43803, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60225	Guarding temporary hazards.		
296-56-60227	River banks.		
296-56-60229	Sanitation.		
296-56-60231	Signs and marking.		
PART K—RELATED TERMINAL OPERATIONS AND EQUIPMENT			
296-56-60233	Related terminal operations and equipment—Machine guarding.	296-56-43805	Protective clothing. [Order 74-14, § 296-56-43805, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60235	Welding, cutting and heating (hot work) (see also definition of "hazardous cargo, material, substance or atmosphere").	296-56-43807	Foot protection. [Order 74-14, § 296-56-43807, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60237	Spray painting.		
296-56-60239	Compressed air.		
296-56-60241	Air receivers.	296-56-43809	Head protection. [Order 74-14, § 296-56-43809, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60243	Fuel handling and storage.		
296-56-60245	Battery charging and changing.		
296-56-60247	Prohibited operations.		
296-56-60249	Petroleum docks.	296-56-43811	Required clothing, caps, etc. [Order 74-14, § 296-56-43811, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-60251	Boat marinas.		
296-56-60253	Canneries and cold storage docks.		
296-56-60255	Excerpts from Revised Code of Washington.	296-56-43813	Protection from falling. [Order 74-14, § 296-56-43813, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-99002	Form—Appendix A—Standard signals for longshore crane signals.		
296-56-99003	Form—Appendix B—Standard signals for longshore crane signals.	296-56-43815	Personal flotation devices. [Order 76-7, § 296-56-43815, filed 3/1/76.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER			
296-56-001	through 296-56-400. [Filed 3/23/60.] Superseded by safety standards for longshore, stevedore and related waterfront operations, filed 9/24/65. See WAC 296-56-401 et seq.	296-56-440	Minimum safety requirements for docks and dock facilities. [Order 74-14, § 296-56-440, filed 4/22/74; Order 69-3, § 296-56-440, filed 5/26/69, effective 7/1/69; § I, Rules 1.010-1.030, filed 9/24/65; Rule (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-401	Scope and application. [Order 74-14, § 296-56-401, filed 4/22/74; Order 69-3, § 296-56-401, filed 5/26/69, effective 7/1/69; Rules (part), filed 9/24/65; Rule (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-442	Crane and spout certification, application. [Order 74-14, § 296-56-442, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-405	Practical application. [Order 74-14, § 296-56-405, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed	296-56-44201	Qualifications of persons making inspections, issuance of certificates, posting certificates, etc. [Order 74-14, §

- 296-56-44201, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44203 Unit proof load test and inspection. [Order 74-14, § 296-56-44203, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44205 Examination and inspection of cranes and derricks. [Order 74-14, § 296-56-44205, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44207 Equipment and information to be installed or posted on cranes or derricks. [Order 74-14, § 296-56-44207, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44209 Cargo spouts, suckers and similar types of equipment. [Order 74-14, § 296-56-44209, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-445 Radio controlled cranes. [Order 69-3, § 296-56-445, filed 5/26/69, effective 7/1/69.] Repealed by Order 74-14, filed 4/22/74.
- 296-56-446 Cranes and crane operations—Scope and application. [Order 74-14, § 296-56-446, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44601 Operators. [Order 74-14, § 296-56-44601, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44603 Signalmen. [Order 74-14, § 296-56-44603, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44605 Signals. [Order 74-14, § 296-56-44605, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44607 Signalman for power units. [Order 74-14, § 296-56-44607, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44609 Radio communication. [Order 74-14, § 296-56-44609, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44611 Obstructions. [Order 74-14, § 296-56-44611, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44613 Crane clearance. [Order 74-14, § 296-56-44613, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44615 Qualifications of machinery operators. [Order 74-14, § 296-56-44615, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-44617 Radio controls. [Order 74-14, § 296-56-44617, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-450 Posting claim procedure. [§ II, Rule 2.010, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74.
- 296-56-455 Inspection of stevedore equipment or gear—Scope and application. [Order 74-14, § 296-56-455, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45501 General requirements. [Order 74-14, § 296-56-45501, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45503 Fiber rope and fiber rope slings. [Order 76-7, § 296-56-45503, filed 3/1/76; Order 74-14, § 296-56-45503, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45505 Wire rope and wire rope slings. [Order 74-14, § 296-56-45505, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45507 Chains and chain slings. [Order 74-14, § 296-56-45507, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45509 Shackles. [Order 74-14, § 296-56-45509, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45511 Hooks other than hand hooks. [Order 74-14, § 296-56-45511, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45513 Cargo boards and other type pallet boards. [Order 74-14, § 296-56-45513, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45515 Chutes, gravity conveyors and rollers. [Order 74-14, § 296-56-45515, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-45517 Disposition of defective material or gear. [Order 74-14, § 296-56-45517, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-460 Minimum requirements for first aid—First-aid training. [§ III, Rule 3.010, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74.
- 296-56-46001 Keep clear of lines. [Order 74-14, § 296-56-460 (codified as WAC 296-56-46001), filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-461 Greasing power units. [Order 74-14, § 296-56-461, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-462 Use of tools. [Order 76-7, § 296-56-462, filed 3/1/76; Order 74-14, § 296-56-462, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-465 Jacob's ladders. [Order 74-14, § 296-56-465, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-467 Secure storage. [Order 74-14, § 296-56-467, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-470 Hard hats—General safety standards. [Order 69-3, § 296-56-470, and Appendix A (Forms), filed 5/26/69, effective 7/1/69; § III, Rules 4.010-4.230, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74. See WAC 296-56-990 through 296-56-99006.
- 296-56-475 Standard gauge railroad operations—Scope and application. [Order 74-14, § 296-56-475, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47501 Warning flags or light. [Order 74-14, § 296-56-47501, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47503 Signals unobscured. [Order 74-14, § 296-56-47503, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47504 Derails. [Order 74-14, § 296-56-47504, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47505 Signals displayed by each maintenance crew. [Order 74-14, § 296-56-47505, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47507 Warning device. [Order 74-14, § 296-56-47507, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47509 Audible warning system. [Order 74-14, § 296-56-47509, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47511 Passageway across railroad tracks required. [Order 74-14, § 296-56-47511, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-47513 Cars to be immobilized. [Order 74-14, § 296-56-47513, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24),

	filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.		84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47515	Working in railroad cars. [Order 74-14, § 296-56-47515, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50009	Slings for handling pulp. [Order 74-14, § 296-56-50009, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47517	Safety observer on railroad switching. [Order 74-14, § 296-56-47517, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50010	Containerized cargo secured by bands or wire. [Order 74-14, § 296-56-50010, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47519	Warning at road crossing. [Order 74-14, § 296-56-47519, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50011	Securing glass cases. [Order 74-14, § 296-56-50011, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47521	Preparation of cars for moving. [Order 74-14, § 296-56-47521, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50013	Hoisting bulk cargo. [Order 76-7, § 296-56-50013, filed 3/1/76; Order 74-14, § 296-56-50013, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47523	Flying switches. [Order 74-14, § 296-56-47523, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50015	Hand and eye protection on wire rope. [Order 74-14, § 296-56-50015, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47525	Car opening devices. [Order 74-14, § 296-56-47525, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50017	Car plates. [Order 74-14, § 296-56-50017, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47527	Safe car floors. [Order 74-14, § 296-56-47527, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50019	Dockboards (bridge plates). [Order 74-14, § 296-56-50019, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47529	Clearance from railroad tracks. [Order 74-14, § 296-56-47529, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50021	Trucks and railroad cars. [Order 74-14, § 296-56-50021, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-47531	Safety while moving cars. [Order 74-14, § 296-56-47531, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50023	Hazardous cargo. [Order 74-14, § 296-56-50023, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-480	Mobile vehicles—Scope and application. [Order 74-14, § 296-56-480, filed 4/22/74; Order § V, Rules 5.010-5.280 filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50025	Recouping broken cargo. [Order 74-14, § 296-56-50025, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-48001	Traffic lanes. [Order 74-14, § 296-56-48001, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-50027	Containerized cargo. [Order 74-14, § 296-56-50027, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-48003	Duties of operator. [Order 74-14, § 296-56-48003, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-510	Handling explosives or hazardous materials. [Order 74-14, § 296-56-510, filed 4/22/74; § VIII, Rules 8.010-8.070, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-48005	Vehicle equipment and maintenance. [Order 74-14, § 296-56-48005, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-520	Log handling on docks. [Order 74-14, § 296-56-520, filed 4/22/74; § IX, Rules 9.010-9.090, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-490	Lift jitneys. [Order 74-14, § 296-56-490, filed 4/22/74; § VI, Rules 6.010-6.100, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-530	Cranes and crane operations. [§ X, Rules 10.010—10.060, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74.
296-56-495	Changing and charging storage batteries. [Order 74-14, § 296-56-495, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-535	Petroleum docks. [Order 74-14, § 296-56-535, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-500	Handling of cargo—Scope and application. [Order 74-14, § 296-56-500, filed 4/22/74; § VII, Rules 7.010-7.110, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-53501	Boat marinas. [Order 74-14, § 296-56-53501, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-50001	Nonuse of defective slings. [Order 74-14, § 296-56-50001, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-53503	Canneries and cold storage docks. [Order 74-14, § 296-56-53503, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
296-56-50003	Landing loads. [Order 74-14, § 296-56-50003, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-540	Application for waiver or variances. [Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74.
296-56-50005	Secure hoisted cargo. [Order 74-14, § 296-56-50005, filed 4/22/74.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.	296-56-550	Practical application. [Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74.
296-56-50007	Hoisting material by bands or fasteners. [Order 76-7, § 296-56-50007, filed 3/1/76; Order 74-14, § 296-56-50007, filed 4/22/74.] Repealed by 85-01-022 (Order	296-56-560	Excerpts from Revised Code of Washington. [Order 74-14, § 296-56-560, filed 4/22/74; Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by 85-01-022 (Order 84-24), filed 12/11/84. Statutory Authority: RCW 49.17.040 and 49.17.050.
		296-56-570	Glossary. [Glossary, filed 9/24/65; Rules (part), filed 3/23/60.] Repealed by Order 74-14, filed 4/22/74.

- 296-56-590 Standard signals for longshore crane operations. Decodified. [See WAC 296-56-990 through 296-56-99006, filed 5/26/69, effective 7/1/69.]
- 296-56-60059 First-aid and lifesaving facilities. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60059, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60059, filed 12/11/84.] Repealed by 99-02-024, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040.
- 296-56-60060 First-aid training and certification. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60060, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60060, filed 12/11/84.] Repealed by 99-02-024, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040.
- 296-56-60062 First-aid kit. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-56-60062, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60062, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60062, filed 12/11/84.] Repealed by 99-02-024, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040.
- 296-56-60065 First-aid station. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60065, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60065, filed 12/11/84.] Repealed by 99-02-024, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040.
- 296-56-60067 First-aid room. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60067, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60067, filed 12/11/84.] Repealed by 99-02-024, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040.
- 296-56-60069 Personnel. [Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-56-60069, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60069, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60069, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60069, filed 12/11/84.] Repealed by 99-02-024, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040.
- 296-56-60137 Waiver and variance. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60137, filed 12/11/84. Repealed by 85-10-004 (Order 85-09), filed 4/19/85. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-60182 Waiver and variance. [Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60182, filed 12/11/84.] Repealed by 85-10-004 (Order 85-09), filed 4/19/85. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-990 Form—Appendix A—Certificate of competency. [Order 74-14, Appendix A (codified as WAC 296-56-990), filed 4/22/74; Form, filed 5/26/69, effective 7/1/69.] Repealed by 86-03-064 (Order 86-02), filed 1/17/86. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-99001 Form—Appendix B—Notice of deficiencies found on certification examination. [Order 74-14, Appendix B (codified as WAC 296-56-99001), filed 4/22/74; Order 69-3, filed 5/26/69, effective 7/1/69.] Repealed by 86-03-064 (Order 86-02), filed 1/17/86. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-99004 Form—Appendix E—Certificate of unit test and/or examination of crane, derrick, or other material handling device. [Order 74-14, Appendix E (codified as WAC 296-56-99004), filed 4/22/74; Form, filed 5/26/69, effective 7/1/69.] Repealed by 86-03-064 (Order 86-02), filed 1/17/86. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-99005 Form—Appendix F—Standard procedure—Testing and examination cranes, derricks, or material handling devices longshore, stevedore, and related waterfront operations. [Order 74-14, Appendix F (codified as WAC 296-56-99005), filed 4/22/74.] Repealed by 86-03-064 (Order 86-02), filed 1/17/86. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-56-99006 Form—Appendix G—Standard procedure—Testing and inspection cargo spouts, suckers and similar equipment longshore, stevedore and related waterfront operations. [Order 74-14, Appendix G (codified as WAC 296-

56-99006), filed 4/22/74.] Repealed by 86-03-064 (Order 86-02), filed 1/17/86. Statutory Authority: RCW 49.17.040 and 49.17.050.

PART A—GENERAL

WAC 296-56-600 Marine terminals.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-600, filed 12/11/84.]

WAC 296-56-60001 Scope and applicability. (1) The

rules included in this chapter apply throughout the state of Washington, to any and all waterfront operations under the jurisdiction of the department of labor and industries.

(2) These minimum requirements are promulgated in order to augment the general safety and health standards, and any other safety and health standards promulgated by the department of labor and industries which are applicable to all places of employment under the jurisdiction of the department of labor and industries. The rules of this chapter, and the rules of chapters 296-24 and 296-62 WAC are applicable to all longshore, stevedore and related waterfront operations: Provided, That such rules shall not be applicable to those operations under the exclusive safety jurisdiction of the federal government.

(3) The provisions of this chapter shall prevail in the event of a conflict with, or duplication of, provisions contained in chapters 296-24 and 296-62 WAC. Specific standards which are applicable include, but are not limited to:

(a) Electrical—Chapter 296-24 WAC Part L.

(b) Toxic and hazardous substances are regulated by chapter 296-62 WAC. Where references to this chapter are given they are for informational purposes only. Where specific requirements of this chapter conflict with the provisions of chapter 296-62 WAC this chapter prevails. Chapter 296-62 WAC does not apply when a substance or cargo is contained within a manufacturer's original, sealed, intact means of packaging or containment complying with the department of transportation or International Maritime Organization requirements.

(c) Hearing conservation—Chapter 296-62 WAC Part K.

(d) Standards for commercial diving operations—Chapter 296-37 WAC.

(e) Safety requirements for scaffolding—Chapter 296-24 WAC Part J-1.

(f) Safe practices of abrasive blasting operations—Chapter 296-24 WAC Part H-2.

(g) Access to employee exposure and medical records—Chapter 296-62 WAC Part B.

(h) Respiratory protection—Chapter 296-62 WAC Part E.

(i) Safety standards for grain handling facilities—Chapter 296-99 WAC.

(j) Hazard communication purpose—Chapter 296-62 WAC Part C.

(k) Asbestos—Chapters 296-62 Part I-1 and 296-65 WAC.

(l) Permit - required confined spaces and confined space—Chapter 296-62 WAC Part M.

(m) Servicing multi-piece and single-piece rim wheels—Chapter 296-24 WAC Part D.

(n) First-aid requirements—Chapter 296-24 WAC Part A-1.

(o) Employee emergency plans and fire prevention plans—Chapter 296-24 WAC Part G-1.

(4) The provisions of this chapter do not apply to the following:

(a) Fully automated bulk coal handling facilities contiguous to electrical power generating plants.

(b) Facilities subject to the regulations of the office of pipeline safety regulation of the materials transportation bureau, department of transportation, to the extent such regulations apply.

(5) WAC 296-62-074 shall apply to the exposure of every employee to cadmium in every employment and place of employment covered by chapter 296-56 WAC in lieu of any different standard on exposures to cadmium that would otherwise be applicable by virtue of those sections.

[Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60001, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-56-60001, filed 1/18/95, effective 3/1/95; 93-07-044 (Order 93-01), § 296-56-60001, filed 3/13/93, effective 4/27/93. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60001, filed 10/30/92, effective 12/8/92. Statutory Authority: Chapter 49.17 RCW, 91-24-017 (Order 91-07), § 296-56-60001, filed 11/22/91, effective 12/24/91; 89-11-035 (Order 89-03), § 296-56-60001, filed 5/15/89, effective 6/30/89; 88-14-108 (Order 88-11), § 296-56-60001, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60001, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60001, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60001, filed 12/11/84.]

WAC 296-56-60003 Variance and procedure. Conditions may exist under which certain state standards will not have practical application. In these cases, the director of the department of labor and industries has made provisions for the issuance of variances. The director or his/her authorized representative may, pursuant to this section, RCW 49.17.080 and 49.17.090, and WAC 296-350-200 through 296-350-270, upon receipt of application and after investigation by the department, permit a variation from the requirements of this chapter. Any variance is limited to the particular case and application. It shall remain posted during the time which it is in effect. Variance application forms may be obtained from the department.

[Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-56-60003, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60003, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60003, filed 12/11/84.]

WAC 296-56-60005 Definitions. "Apron" means that open portion of a marine terminal immediately adjacent to a vessel berth and used in the direct transfer of cargo between the terminal and vessel.

"Assistant director for the division of WISHA services" means the assistant director of WISHA services, department of labor and industries or his/her authorized representative.

"Authorized," in reference to an employee's assignment, means selected by the employer for that purpose.

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"Cargo door" (transit shed door) means a door designed to permit transfer of cargo to and from a marine terminal structure.

"Cargo packaging" means any method of containment for shipment, including cases, cartons, crates and sacks, but excluding large units such as intermodal containers, vans or similar devices.

"Confined space" means a space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and

- Is not designed for continuous employee occupancy.

"Conveyor" means a device designed exclusively for transporting bulk materials, packages or objects in a predetermined path and having fixed or selective points of loading or discharge.

"Danger zone" means any place in or about a machine or piece of equipment where an employee may be struck by or caught between moving parts, caught between moving and stationary objects or parts of the machine, caught between the material and a moving part of the machine, burned by hot surfaces or exposed to electric shock. Examples of danger zones are nip and shear points, shear lines, drive mechanisms, and areas beneath counterweights.

"Designated person" means a person who possesses specialized abilities in a specific area and is assigned by the employer to perform a specific task in that area.

"Dock" means a wharf or pier forming all or part of a waterfront facility, including marginal or quayside berthing facilities; not to be confused with "loading dock" as at a transit shed or container freight station, or with the body of water between piers or wharves.

"Dock facilities" includes all piers, wharves, sheds, aprons, dolphins, cranes, or other gear or equipment owned or controlled by the dock or facility owner, where cargo or materials are loaded, moved or handled to or from a vessel.

"Dockboards" (car and bridge plates) mean devices for spanning short distances between rail cars or highway vehicles and loading platforms that do not expose employees to falls greater than 4 feet (1.22 m).

"Enclosed space" means an indoor space, other than a confined space, that may contain or accumulate a hazardous atmosphere due to inadequate natural ventilation. Examples of enclosed spaces are trailers, railcars, and storage rooms.

"Examination," as applied to material handling devices required to be certified by this chapter, means a comprehensive survey consisting of the criteria outlined in WAC 296-56-60093 through 296-56-60097. The examination is supplemented by a unit proof test in the case of annual survey.

"Flammable atmosphere" means an atmosphere containing more than ten percent of the lower flammable limit (LEL) of a flammable or combustible vapor or dust mixed with air. Such atmospheres are usually toxic as well as flammable.

"Front-end attachments."

- As applied to power-operated industrial trucks, means the various devices, such as roll clamps, rotating and side-shifting carriages, magnets, rams, crane arms or booms, load

stabilizers, scoops, buckets, and dumping bins, attached to the load end for handling lifts as single or multiple units.

- As applied to cranes, means various attachments applied to the basic machine for the performance of functions such as lifting, clamshell or magnet services.

"Fumigant" is a substance or mixture of substances, used to kill pests or prevent infestation, which is a gas or is rapidly or progressively transformed to the gaseous state even though some nongaseous or particulate matter may remain and be dispersed in the treatment space.

"Hazardous cargo, material, substance or atmosphere" means:

- Any substance listed in chapter 296-62 WAC;
- Any material in the hazardous materials table and hazardous materials communications regulations of the Department of Transportation, 49 CFR Part 172;

- Any article not properly described by a name in the hazardous materials table and hazardous materials communications regulations of the Department of Transportation, 49 CFR Part 172, but which is properly classified under the definition of those categories of dangerous articles given in 49 CFR Part 173;

- Atmospheres having concentrations of airborne chemicals in excess of permissible exposure limits as defined in chapter 296-62 WAC; or

- Any atmosphere with an oxygen content of less than nineteen and one-half percent by volume.

"House falls" means spans and supporting members, winches, blocks, and standing and running rigging forming part of a marine terminal and used with a vessel's cargo gear to load or unload by means of married falls.

"Inspection," as applied to material handling devices required to be certified by this chapter, includes a complete visual examination of all visible parts of the device.

"Intermodal container" means a reusable cargo container of rigid construction and rectangular configuration intended to contain one or more articles of cargo or bulk commodities for transportation by water and one or more other transport modes without intermediate cargo handling. The term includes completely enclosed units, open top units, fractional height units, units incorporating liquid or gas tanks and other variations fitting into the container system, demountable or with attached wheels. It does not include cylinders, drums, crates, cases, cartons, packages, sacks, unitized loads or any other form of packaging.

"Loose gear" means removable or replaceable components of equipment or devices which may be used with or as a part of assembled material handling units for purposes such as making connections, changing line direction and multiplying mechanical advantage. Examples include shackles and snatch blocks.

"Marina" means a small harbor or boat basin providing dockage, supplies, and services for small craft.

"Marine terminal" means wharves, bulkheads, quays, piers, docks and other berthing locations and adjacent storage or contiguous areas and structures associated with the primary movement of cargo or materials from vessel to shore or shore to vessel. It includes structures which are devoted to receiving, handling, holding, consolidation, loading or delivery of waterborne shipments and passengers, and areas

devoted to the maintenance of the terminal or equipment. The term does not include production or manufacturing areas having their own docking facilities and located at a marine terminal nor storage facilities directly associated with those production or manufacturing areas.

"Permit-required confined space (permit space)" means a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere;

- Contains a material that has the potential for engulfing an entrant;

- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

- Contains any other recognized serious safety or health hazard.

"Ramps" mean other flat-surface devices for passage between levels and across openings not covered under "dockboards."

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60005, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60005, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-56-60005, filed 1/18/95, effective 3/1/95. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60005, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60005, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60005, filed 12/11/84.]

WAC 296-56-60006 Personnel. (1) Qualifications of machinery operators.

(a) Only those employees determined by the employer to be competent by reason of training or experience, who understand the signs, notices, and operating instructions and are familiar with the signal code in use shall be permitted to operate a crane, winch, or other power-operated cargo handling apparatus, or any power-operated vehicle, or give signals to the operator of any hoisting apparatus. Employees being trained and supervised by a designated individual may operate such machinery and give signals to operators during training.

(b) No employee known to have defective uncorrected eyesight or hearing, or to be suffering from heart disease, epilepsy, or similar ailments which may suddenly incapacitate the employee shall be permitted to operate a crane, winch, other power-operated cargo handling apparatus, or a power-operated vehicle.

(c) Persons who have recovered from a heart attack shall be exempted from the provisions of (b) of this subsection, as it pertains to their heart condition, provided:

(i) A medical release is obtained from their attending medical doctor.

(ii) The release shall state that the operation of a crane, winch, power-operated cargo handling apparatus, or power-operated vehicle, will not present a hazard to themselves or others.

(iii) An examination by a medical doctor, and renewal of the work release certification is required annually.

(2) Supervisory accident prevention proficiency.

(a) Immediate supervisors of cargo-handling operations of more than five persons shall satisfactorily complete a course in accident prevention. Employees newly assigned to supervisory duties shall be required to meet the provisions of this subsection (2)(a) within ninety days of such assignment.

(b) The course shall consist of instruction suited to the particular operations involved.

(c) No minor under eighteen years of age shall be employed in occupations involving the operation of any power-operated hoisting apparatus or assisting in such operations by performing work such as hooking on or landing drafts, rigging gear, etc.

[Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60006, filed 12/30/98, effective 3/30/99.]

WAC 296-56-60007 Housekeeping. (1) Active work areas shall be kept free of equipment and materials not in use, and clear of debris, projecting nails, strapping and other sharp objects not necessary for the work in progress.

(2) Hatch beams, covers, and pontoons placed in terminal working areas shall be stowed in stable piles with beams secured against tipping or falling. Alternatively, beams may be laid on their sides. When beams and pontoons are stowed in tiers more than one high, dunnage or other suitable material shall be used under and between tiers.

(3) Cargo and material shall not obstruct access to vessels, cranes, vehicles, or buildings. Means of access and egress within buildings shall be unobstructed.

(4) The employer shall eliminate, to the extent possible, conditions causing slippery working or walking surfaces in immediate work areas used by employees.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060, 92-22-067 (Order 92-06), § 296-56-60007, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60007, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60007, filed 12/11/84.]

WAC 296-56-60009 Accident prevention program.

(1) An accident prevention program, which provides equitable management-employee participation, shall be established in all establishments, industrial plants, or operations.

(2) It shall be the responsibility of the employer to initiate and maintain the accident prevention program necessary to comply with this section. The division of WISHA services may be contacted for assistance in initiating and maintaining an effective accident prevention program.

(3) All accident prevention programs shall be tailored to the needs of the particular operation.

(4) Employer and employee representatives, as elected, delegated or appointed, shall attend and actively take part in frequent and regular safety committee meetings.

(5) Accident prevention programs shall provide for employer-employee safety meetings and frequent and regular safety inspections of job sites, materials, equipment, and operating procedures.

(6) A record of safety activities, such as inspections and meetings, shall be maintained by the employer for a period covering the previous twelve months and shall be made avail-

able, upon request, to noncompliance personnel of the department of labor and industries.

(7) Employees shall individually comply with all safety rules and cooperate with management in carrying out the accident prevention program.

(8) To make effective the preceding statement and promote on-the-job accident prevention, committees shall be established in each port. These committees shall consist of an equal number of port or stevedore company and longshoremen representatives at the job level with the industry or company safety supervisor serving as secretary and coordinator. Some functions of the committee are to maintain the interest of the workers in accident prevention by providing for their actual participation in the program, to direct their attention to the real causes of accidents, and to provide a means for making practical use of their intimate knowledge of working conditions and practices.

(9) It is intended that this program will produce mutually practical and effective recommendations regarding correction of accident-producing circumstances and conditions.

Note: For first aid requirements, see chapter 296-24 WAC Part A-1.

Note: For emergency plan and fire prevention plan requirements, see chapter 296-24 WAC Part G-1.

[Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60009, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-56-60009, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60009, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60009, filed 12/11/84.]

PART B—WATERFRONT OPERATIONS

WAC 296-56-60011 Slinging. (1) Drafts shall be safely slung before being hoisted. Loose dunnage or debris hanging or protruding from loads shall be removed.

(2) Bales of cotton, wool, cork, wood pulp, gunny bags, or similar articles shall be hoisted only by straps strong enough to support the weight of the bale. At least two hooks, each in a separate strap, shall be used.

(3) Unitized loads bound by bands or straps shall only be hoisted by the banding or strapping if the banding or strapping is suitable for hoisting and is strong enough to support the weight of the load.

(4) Additional means of hoisting shall be employed to ensure safe lifting of unitized loads having damaged banding or strapping.

(5) Case hooks shall be used only with cases designed to be hoisted by these hooks.

(6) Loads requiring continuous manual guidance during handling shall be guided by guide ropes (tag lines) that are long enough to control the load.

(7) Intermodal containers shall be handled in accordance with WAC 296-56-60103.

(8) The employer shall require employees to stay clear of the area beneath overhead drafts or descending lifting gear.

(9) Employees shall not be permitted to ride the hook or the load.

(10) Cargo handling bridles, such as pallet bridles, which are to remain attached to the hoisting gear while hoisting successive drafts, shall be attached by shackles, or other positive

means shall be taken to prevent them from becoming accidentally disengaged from the cargo hook.

(11) Drafts of lumber, pipe, dunnage and other pieces, the top layer of which is not bound by the sling, shall be slung in such a manner as to prevent sliders. Double slings shall be used on unstrapped dunnage, except, when due to the size of hatch or deep tank openings, it is impractical to use them.

(12) Hand loaded buckets, tubs, bins and baskets used in handling bulk cargo shall not be loaded above their rim.

[Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60011, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60011, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60011, filed 12/11/84.]

WAC 296-56-60013 Stacking of cargo and pallets.

Cargo, pallets, and other material stored in tiers shall be stacked in such a manner as to provide stability against sliding and collapse.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 85-01-022 (Order 84-24), § 296-56-60013, filed 12/11/84.]

WAC 296-56-60015 Coopering. Repair and reconditioning of damaged or leaking cargo packaging (coopering) shall be performed so as not to endanger employees.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 85-01-022 (Order 84-24), § 296-56-60015, filed 12/11/84.]

WAC 296-56-60017 Line handling. (1) In order to provide safe access for handling lines while mooring and unmooring vessels, cargo or material shall not be stowed or vehicles placed where they obstruct the work surface.

(2) When stringpiece or apron width is insufficient for safe footing, grab lines on rails shall be installed on the sides of permanent structures. ("Stringpiece" means a narrow walkway between the water edge of a berth and a shed or other structure.)

(3) Areas around bitts or cleats where workers perform their duties as line handlers shall be lighted as required by this chapter. There shall be a nonslip surface around each bitt or cleat.

(4) Walkways on which mooring hausers must be moved may have the handrail omitted on the line handling side provided a six inch by six inch toeboard is installed.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60017, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60017, filed 12/11/84.]

WAC 296-56-60019 Standard gauge railroad operations. WAC 296-56-60019 through 296-56-60041 apply to standard gauge railroad operations.

(1) Work shall be performed in railcars only if floors of the railcars are in visibly safe condition for the work activity being conducted and the equipment being used.

(2) A route shall be established to allow employees to pass to and from places of employment without passing under, over or through railcars, or between cars less than ten feet (3 m) apart on the same track.

(3) The employer shall direct that no employees remain in railcars after work is concluded. No employee shall remain in a railcar after work is concluded.

(2001 Ed.)

(4) Railcars shall be chocked or otherwise prevented from moving:

(a) While dockboards or carplates are in position; or

(b) While employees are working within, on or under the railcars or near the tracks at the ends of the cars.

(5) When employees are working in, on, or under a railcar, positive means shall be taken to protect them from exposure to impact from moving railcars.

(6) Work being carried on, in, or under cars which subjects employees to the hazard of moving railroad equipment shall be protected by flags and derails set a minimum of fifty feet from one or both ends of the worksite. Where the spur track switch is less than fifty feet from the work location, the switch padlocked in the open position may take the place of the derail. The blue flag shall be placed at that point.

(7) Before cars are moved, unsecured and over-hanging stakes, wire straps, banding, and similar objects shall be removed or placed so as not to create hazards.

(8) The employer shall institute all necessary controls during railcar movement to safeguard personnel. If winches or capstans are employed for movement, employees shall stand clear of the hauling rope and shall not stand between the rope and the cars.

(9) Before being opened fully, doors shall be opened slightly to ensure that the load has not shifted during transit. Special precautions shall be taken if the doors being opened are visibly damaged.

(10) If power industrial trucks are used to open freight car doors, the trucks or the railcar doors shall be equipped with door opening attachments. Employees shall stand clear of the railcar doors while they are being opened and closed.

(11) Only railcar door openers or power trucks equipped with door opening attachments shall be used to open jammed doors.

(12) Employees shall not remain in or on gondolas or flat cars when drafts that create overhead, caught-in, caught-between or struck-by hazards are being landed in or on the railcar. End gates, if raised, shall be secured.

(13) Operators of railcar dumps shall have an unrestricted view of dumping operations and shall have emergency means of stopping movement.

(14) Recessed railroad switches shall be enclosed to provide a level surface.

(15) Warning signs shall be posted where doorways open onto tracks, at blind corners and at similar places where vision may be restricted.

(16) Warning signs shall be posted if insufficient clearance for personnel exists between railcars and structures.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60019, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60019, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60019, filed 12/11/84.]

WAC 296-56-60021 Signals displayed by each maintenance crew. Each maintenance crew shall display and remove its own set of blue signals.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 85-01-022 (Order 84-24), § 296-56-60021, filed 12/11/84.]

WAC 296-56-60023 Warning flags or lights. A blue flag, bright colored flag or blue light shall be displayed at one or both ends of an engine, car or train to indicate that workers are under or about the railway equipment. When such warning devices are displayed, the equipment shall not be coupled to or moved. On a dead end spur, a blue light or flag may be displayed adjacent to the switch opening while cars are being loaded or unloaded.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60023, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60023, filed 12/11/84.]

WAC 296-56-60025 Signals unobscured. Equipment which could obscure signals shall not be placed on the track.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60025, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60025, filed 12/11/84.]

WAC 296-56-60027 Audible warning system. A clearly audible warning system shall be employed when cars are being moved in areas where workers may be in the vicinity of the tracks. When the audible warning signal might not be heard above the surrounding noises, a person shall be delegated and stationed close enough to the track crew to warn them, by contact, of the oncoming equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60027, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60027, filed 12/11/84.]

WAC 296-56-60029 Safety observer on railroad switching. When persons are required to work between railway cars, underneath railway cars or in areas where switching is done, there shall be a person charged with the responsibility to warn of an approaching switch of the railway car or cars, unless other reasonable and practical safeguards are provided.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60029, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60029, filed 12/11/84.]

WAC 296-56-60031 Warning at road crossing. An audible whistle, horn or bell shall be sounded by the locomotive engineer to give adequate warning prior to switching across any road crossing. Whenever cars are pushed with a locomotive, a signalman shall be located at the crossing to give signals in conjunction with other warnings by the engineer.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60031, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60031, filed 12/11/84.]

WAC 296-56-60033 Flying switches. Flying switches shall not be used when switching railroad equipment in congested areas or across roadways or walkways.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60033, filed 12/11/84.]

WAC 296-56-60035 Clearance from railroad tracks. Materials shall not be stacked or piled closer than eight and one-half feet from the center line of the railroad tracks.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60035, filed 12/11/84.]

WAC 296-56-60037 Car plates. Whenever workers are required to move cargo into or out of a railway car, a railway car plate shall be used which shall meet the following specifications:

(1) All car plates shall be strong enough to carry maximum loads with a safety factor of three.

(2) All car plates shall be provided with positive stops to prevent shifting of plates. One set of these stops shall be adjustable to allow for different spaces between car door and platform.

(3) Car plates shall be so shaped that edges will always bear on the floor of car and platform to prevent "teetering" or rocking.

(4) All car plates shall have skid resistant surfaces.

(5) All car plates shall be provided with toe or guard plates at the sides with a minimum height of four inches.

(6) All car plates must bear no less than six inches back from edge of platform.

(7) Maximum capacity of car plates shall be marked in a conspicuous place.

(8) Car plates shall be provided with an appropriate fixture to enable the plates to be lifted and moved by fork trucks.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60037, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60037, filed 12/11/84.]

WAC 296-56-60039 Dockboards (bridge plates). (1) Portable and powered dockboards shall be strong enough to carry the load imposed.

(2) Portable dockboards shall be secured in position, either by being anchored or equipped with devices which will prevent slipping.

(3) Powered dockboards shall be designed and constructed in accordance with commercial standards CS202-56 (1956) *Industrial Lifts and Hinged Loading Ramps* published by the United States Department of Commerce.

(4) Handholds or other effective means, shall be provided on portable dockboards to permit safe handling.

(5) Positive protection shall be provided to prevent railroad cars from being moved while dockboards or bridge plates are in position.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60039, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60039, filed 12/11/84.]

WAC 296-56-60041 Log handling. (1) The employer shall ensure that structures (bunks) used to contain logs have rounded corners and rounded structural parts to avoid sling damage.

(2) Two or more binders or equivalently safe means of containment shall remain on logging trucks and railcars to secure logs during movement of the truck or car within the terminal. During unloading, logs shall be prevented from moving while binders are being removed.

(3) Logs shall be hoisted by two slings or by other gear designed for safe hoisting.

(4) Logs placed adjacent to vehicle curbs on the dock shall not be over one tier high unless placed in bunks or so stacked as not to roll or otherwise creating a hazard to employees.

(5) Before logs are slung up from the dock, they shall be stably supported to prevent spreading and to allow passage of slings beneath the load. When bunks or similar retaining devices are used, no log shall be higher than the stanchions or retaining members of the device.

(6) A draft of logs for hoisting aboard ship shall not vary in length more than twenty percent.

(7) Audible alarms.

(a) All bidirectional machines, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in operable condition.

(b) Automatic back-up alarms shall be installed on bidirectional equipment used to handle logs or containers and shall be maintained in operable condition.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60041, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60041, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60041, filed 12/11/84.]

WAC 296-56-60043 Movement of barges and railcars. Barges and railcars shall not be moved by cargo runners (running rigging) from vessel cargo booms, cranes or other equipment not suitable for the purpose.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60043, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60043, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60043, filed 12/11/84.]

WAC 296-56-60045 Communication. (1) Radio. When practical and safe, crane operators shall be provided with a radio or telephone to be in contact with the signalman or crane chaser in those cases where a signalman or crane chaser is required.

(2) Interference. Cargo handling operations shall not be carried on when noise-producing maintenance, construction or repair work interferes with communication of warnings or instructions.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-56-60045, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60045, filed 12/11/84.]

WAC 296-56-60047 Open fires. Open fires and fires in drums or similar containers are prohibited.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60047, filed 12/11/84.]

PART C—HAZARDOUS ATMOSPHERES AND MATERIALS

WAC 296-56-60049 Hazardous cargo. (1) Before cargo handling operations begin, the employer shall ascertain whether any hazardous cargo is to be handled and shall determine the nature of the hazard. The employer shall inform

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employees of the nature of any hazard and any special precautions to be taken to prevent employee exposure, and shall instruct employees to notify the employer of any leaks or spills.

(2) All hazardous cargo shall be slung and secured so that neither the draft nor individual packages can fall as a result of tipping the draft or slackening of the supporting gear.

(3) If hazardous cargo is spilled or if its packaging leaks, employees shall be removed from the affected area until the employer has ascertained the specific hazards, provided any equipment, clothing, ventilation and fire protection equipment necessary to eliminate or protect against the hazard. Cleanup employees shall be instructed as to the safe method of cleaning up and disposing of the spill, and handling and disposing of leaking containers. Actual cleanup or disposal work shall be conducted under the supervision of a designated person.

(4) The Department of Transportation and the United States Coast Guard impose requirements related to handling, storing and transportation of hazardous cargo (see 33 CFR Part 126, 46 CFR, 49 CFR).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60049, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60049, filed 12/11/84.]

WAC 296-56-60051 Handling explosives or hazardous materials. (1) All workers handling explosive or other hazardous material which is properly labeled pursuant to the Washington State Labeling Code, chapters 296-62 and 296-64 WAC, promulgated by the department of labor and industries; or the Explosive Act, chapter 70.74 RCW and chapter 296-52 WAC; or the Federal and Washington State Food, Drug and Cosmetic Acts; the Federal Insecticide, Fungicide and Rodenticide Act, the Washington Pesticide Act, chapter 17.21 RCW; the Federal Hazardous Substances Labeling Act; or the Interstate Commerce Commission and Foreign Commerce regulations; or explosives or other dangerous cargo which is reasonably known by the employers to be mislabeled or to be lacking a required label, shall be thoroughly informed by the employer of the explosive or hazardous nature of the cargo.

(2) In all shipping operations including, but not limited to, handling, storage, and preparation, compliance with the standards of the Interstate Commerce Commission, the United States Coast Guard, or the safety rules developed by the Institute of Makers of Explosives shall be deemed proper and safe methods of operation.

(3) Handling of breakage. If breakage should occur while handling explosives or other hazardous materials, the foreman shall order the work in the immediate area to cease until the hazard has been removed. It shall be the responsibility of the employer to use a safe method of handling such breakage and placing it in a remote, safe location.

(4) No smoking. All workers supervising or engaged in the handling, hoisting, stowing of explosives, combustible oxidizing materials or flammable materials shall smoke only in designated areas. No person shall smoke within one hundred feet of any location where such materials are handled or stored.

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(5) Loading chute. In chuting packaged explosives, care must be exercised to ensure that one package is taken from the mat before starting another. Each package shall be completely removed from the mat before another is placed on the chute.

(6) Specifications for chutes. In the loading of explosive merchandise in package form where chutes are used, the chutes shall be constructed only of wood. All fastenings shall be of wooden pins, dowelings, or pegs. Metal fastenings may be used, provided they are countersunk.

(7) Mattress landing buffer. The bottoms of the chutes shall be provided with a stuffed mattress not less than four inches thick and of sufficient width and length to allow for safe landing of packages.

(8) Drafts of hazardous or explosive cargo shall be so slung and secured that neither the draft nor individual packages can fall as a result of tipping the draft or slackening the supporting gear.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60051, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60051, filed 12/11/84.]

WAC 296-56-60053 Hazardous atmospheres and substances. (1) Purpose and scope. This section covers areas where a hazardous atmosphere or substance may exist, except where one or more of the following sections apply: WAC 296-56-60049 Hazardous cargo; WAC 296-56-60051 Handling explosives or hazardous materials; WAC 296-56-60055 Carbon monoxide; WAC 296-56-60057 Fumigants, pesticides, insecticides and hazardous preservatives; WAC 296-56-60107 Terminal facilities handling menhaden and similar species of fish; WAC 296-56-60235 Welding, cutting and heating (hot work); and WAC 296-56-60237 Spray painting.

(2) Determination of hazard.

(a) Whenever a room, building, vehicle, railcar or other space contains or has contained a hazardous atmosphere, a designated and appropriately equipped person shall test the atmosphere before entry to determine whether a hazardous atmosphere exists.

(b) Records of results of any tests required by this section shall be maintained for at least thirty days.

(3) Testing during ventilation. When mechanical ventilation is used to maintain a safe atmosphere, tests shall be made by a designated person to ensure that the atmosphere is not hazardous.

(4) Entry into hazardous atmospheres. Only designated persons shall enter hazardous atmospheres. The following provisions shall apply:

(a) Persons entering a space containing a hazardous atmosphere shall be protected by respiratory and emergency protective equipment meeting the requirements of chapter 296-62 WAC, Part E;

(b) Persons entering a space containing a hazardous atmosphere shall be instructed in the nature of the hazard, precautions to be taken, and the use of protective and emergency equipment. Standby observers, similarly equipped and instructed, shall continuously monitor the activity of employees within such space; and

(c) Except for emergency or rescue operations, employees shall not enter into any atmosphere which has been identified

as flammable or oxygen deficient (less than nineteen and one-half percent oxygen). Persons who may be required to enter flammable or oxygen deficient atmospheres in emergency operations shall be instructed in the dangers attendant to those atmospheres and instructed in the use of self-contained breathing apparatus, which shall be utilized.

(d) To prevent inadvertent employee entry into spaces that have been identified as having hazardous, flammable or oxygen deficient atmospheres, appropriate warning signs or equivalent means shall be posted at all means of access to those spaces.

(5) When the packaging of asbestos cargo leaks, spillage shall be cleaned up by designated employees protected from the harmful effects of asbestos as required by WAC 296-62-07517 and chapter 296-65 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-56-60053, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60053, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60053, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60053, filed 12/11/84.]

WAC 296-56-60055 Carbon monoxide. (1) Exposure limits. The carbon monoxide content of the atmosphere in a room, building, vehicle, railcar or any enclosed space shall be maintained below fifty parts per million (0.005%) as an eight-hour time-weighted average. Employees shall be removed from the enclosed space if the carbon monoxide concentration exceeds one hundred parts per million (0.01%).

(2) Testing. Tests to determine carbon monoxide concentration shall be made whenever necessary to ensure that employee exposure does not exceed the limits specified in subsection (1) of this section.

(3) Instrumentation. Tests for carbon monoxide concentration shall be made by designated persons using gas detector tube units certified by NIOSH under 30 CFR Part 11 or other measuring instruments whose accuracy is as great or greater.

(4) Records. A record of the date, time, location and result of carbon monoxide tests shall be available for at least thirty days.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60055, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60055, filed 12/11/84.]

WAC 296-56-60057 Fumigants, pesticides, insecticides and hazardous preservatives (see also WAC 296-56-60049, 296-56-60051 and 296-56-60053). (1) Whenever cargo in a space is or has been stowed, handled, or treated with a fumigant, pesticide, insecticide, or hazardous preservative, a determination shall be made as to whether a hazardous atmosphere is present in the space. Only employees protected as required in subsection (5) of this section shall enter the space if it is hazardous.

(2) Tests to determine the atmospheric concentration of chemicals used to treat cargo shall be:

- (a) Appropriate for the hazard involved;
- (b) Conducted by designated persons; and

(c) Performed at the intervals necessary to ensure that employee exposure does not exceed the permissible exposure limit for the chemical involved, see chapter 296-62 WAC.

(3) Results of any tests shall be available for at least thirty days.

(4) Chemicals shall only be applied to cargoes by designated persons.

(5) Only designated persons shall enter hazardous atmospheres. Whenever a hazardous atmosphere is entered the following provisions apply.

(a) Persons entering a space containing a hazardous atmosphere shall be protected by respiratory and emergency protective equipment meeting the requirements of part G of this standard; and

(b) Persons entering a space containing a hazardous atmosphere shall be instructed in the nature of the hazard, precautions to be taken, and the use of protective and emergency equipment. Standby observers, similarly equipped and instructed, shall continuously monitor the activity of employees within such a space.

(6) Signs shall be clearly posted where fumigants, pesticides or hazardous preservatives have created a hazardous atmosphere. These signs shall note the danger, identify specific chemical hazards, and give appropriate information and precautions, including instructions for the emergency treatment of employees affected by any chemical in use.

(7) In the case of containerized shipments of fumigated tobacco, the contents of the container shall be aerated by opening the container doors for a period of forty-eight hours after the completion of fumigation and prior to loading. When tobacco is within shipping cases having polyethylene or similar bag liners, the aeration period shall be seventy-two hours. The employer shall obtain a written warranty from the fumigation facility stating that the appropriate aeration period has been met.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60057, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60057, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60057, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60057, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60057, filed 12/11/84.]

PART E—CARGO HANDLING GEAR AND EQUIPMENT

WAC 296-56-60071 House falls. (1) Span beams shall be secured to prevent accidental dislodgement.

(2) A safe means of access shall be provided for employees working with house fall blocks.

(3) Designated employees shall inspect chains, links, shackles, swivels, blocks and other loose gear used in house fall operations before each day's use. Defective gear shall not be used.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60071, filed 12/11/84.]

WAC 296-56-60073 Miscellaneous auxiliary gear. (1) Routine inspection.

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(a) At the completion of each use, loose gear such as slings, chains, bridles, blocks, and hooks shall be so placed as to avoid damage to the gear. Loose gear shall be inspected and any defects corrected before re-use.

(b) All loose gear shall be inspected by the employer or his/her authorized representative before each use and, when necessary, at intervals during its use, to ensure that it is safe. Any gear which is found upon inspection to be unsafe shall not be used until it is made safe.

(c) Defective gear shall not be used. Distorted hooks, shackles, or similar gear shall be discarded.

(d) Chains or other gear which have been lengthened, altered, or repaired by welding shall be properly heat treated, and before again being put into use, shall be tested and reexamined in the manner set forth in WAC 296-56-60097 and 296-56-60098.

(2) The employer shall maintain a record of the dates and results of the tests with each unit of gear concerned clearly identified. The records shall be available for examination by division of consultation and compliance personnel and the employee safety committee.

(3) Wire rope and wire rope slings.

(a) The employer shall ascertain and adhere to the manufacturer's recommended ratings for wire rope and wire rope slings and shall have such ratings available at the terminal. When the manufacturer is unable to supply such ratings, the employer shall use the tables for wire rope and wire rope slings found in American National Safety Standard for Slings, ANSI/ASME B30.9-1984. A design safety factor of at least five shall be maintained for the common sizes of running wire used as falls, in purchases or in such uses as light load slings. Wire rope with a safety factor of less than five may be used only:

(i) In specialized equipment, such as cranes designed to be used with lesser wire rope safety factors;

(ii) In accordance with design factors in standing rigging applications; or

(iii) For heavy lifts or other purposes for which a safety factor of five is impractical and for which the employer can demonstrate that equivalent safety is ensured.

(b) Wire rope or wire rope slings exhibiting any of the following conditions shall not be used:

(i) Ten randomly distributed broken wires in one rope lay or three or more broken wires in one strand in one rope lay;

(ii) Kinking, crushing, bird caging, or other damage resulting in distortion of the wire rope structure;

(iii) Evidence of heat damage;

(iv) Excessive wear, corrosion, deformation or other defect in the wire or attachments, including cracks in attachments;

(v) Any indication of strand or wire slippage in end attachments; or

(vi) More than one broken wire in the close vicinity of a socket or swaged fitting.

(c) Four by twenty-nine (4 x 29) wire rope shall not be used in any running rigging.

(d) Protruding ends of strands in splices on slings and bridles shall be covered or blunted. Coverings shall be

removable so that splices can be examined. Means used to cover or blunt ends shall not damage the wire.

(e) Where wire rope clips are used to form eyes, the employer shall adhere to the manufacturer's recommendations, which shall be available at the terminal. If "U" bolt clips are used and the manufacturer's recommendations are not available, Table C-1 shall be used to determine the number and spacing of clips. "U" bolts shall be applied with the "U" section in contact with the dead end of the rope.

Table C-1— Number and Spacing of U-Bolt Wire Rope Clips

Improved plow steel, rope diameter inches/(cm)	Minimum number of clips		Minimum spacing inches/(cm)
	Drop forged	Other material	
1/2 or less (1.3)	3	4	3 (7.6)
5/8 (1.6)	3	4	3 3/4 (9.5)
3/4 (1.9)	4	5	4 1/2 (11.4)
7/8 (2.2)	4	5	5 1/4 (13.3)
1 (2.5)	5	7	6 (15.2)
1 1/8 (2.9)	6	7	6 3/4 (17.1)
1 1/4 (3.2)	6	8	7 1/2 (19.1)
1 3/8 (3.5)	7	8	8 1/4 (21.0)
1 1/2 (3.8)	7	9	9 (22.9)

(f) Wire rope shall not be secured by knots.

(g) Eyes in wire rope bridles, slings, bull wires, or in single parts used for hoisting shall not be formed by wire rope clips or knots.

(h) Eye splices in wire ropes shall have at least three tucks with a whole strand of the rope and two tucks with one-half of the wire cut from each strand. Other forms of splices or connections which are demonstrated to be equally safe may be used.

(i) Except for eye splices in the ends of wires and for endless rope slings, each wire rope used in hoisting or lowering, or in bulling cargo, shall consist of one continuous piece without knot or splice.

(4) Natural fiber rope.

(a) The employer shall ascertain the manufacturer's ratings for the specific natural fiber rope used and have such ratings available at the terminal. The manufacturer's ratings shall be adhered to and a minimum design safety factor of five maintained.

(b) Eye splices shall consist of at least three full tucks. Short splices shall consist of at least six full tucks, three on each side of the center line.

(5) Synthetic rope.

(a) The employer shall adhere to the manufacturer's ratings and use recommendations for the specific synthetic fiber rope used and shall have such ratings available at the terminal.

(b) Unless otherwise recommended by the manufacturer, when synthetic fiber ropes are substituted for manila ropes of less than three inches (7.62 cm) circumference, the substitute shall be of equal size. Where substituted for manila rope of three inches or more in circumference, the size of the synthetic rope shall be determined from the formula:

$$C = \sqrt{.6(C_s^2) + 4(C_m^2)}$$

Where C= the required circumference of the synthetic rope in inches, C_s = the circumference to the nearest one-quarter inch of a synthetic rope having a breaking strength not less than that of the size manila rope that would be required by subsection (4) of this section, and C_m = the circumference of manila rope in inches which would be required by subsection (4) of this section.

(c) In making such substitution, it shall be ascertained that the inherent characteristics of the synthetic fiber are suitable for hoisting.

(6) Removal of natural and synthetic rope from service. Natural or synthetic rope having any of the following defects shall be removed from service:

(a) Abnormal wear;

(b) Powdered fiber between strands;

(c) Sufficient cut or broken fibers to affect the capacity of the rope;

(d) Variations in the size or roundness of strands;

(e) Discolorations other than stains not associated with rope damage;

(f) Rotting; or

(g) Distortion or other damage to attached hardware.

(7) Thimbles. Properly fitting thimbles shall be used where any rope is secured permanently to a ring, shackle or attachment, where practical.

(8) Synthetic web slings.

(a) Slings and nets or other combinations of more than one piece of synthetic webbing assembled and used as a single unit (synthetic web slings) shall not be used to hoist loads in excess of the sling's rated capacity.

(b) Synthetic web slings shall be removed from service if they exhibit any of the following defects:

(i) Acid or caustic burns;

(ii) Melting or charring of any part of the sling surface;

(iii) Snags, punctures, tears or cuts;

(iv) Broken or worn stitches;

(v) Distortion or damage to fittings; or

(vi) Display of visible warning threads or markers designed to indicate excessive wear or damage.

(c) Defective synthetic web slings removed from service shall not be returned to service unless repaired by a sling manufacturer or similar entity. Each repaired sling shall be proof tested by the repairer to twice the slings' rated capacity prior to its return to service. The employer shall retain a certificate of the proof test and make it available for examination.

(d) Synthetic web slings provided by the employer shall only be used in accordance with the manufacturer's recommendations, which shall be made available upon request.

(e) Fittings shall have a breaking strength at least equal to that of the sling to which they are attached and shall be free of sharp edges.

(9) Chains and chain slings used for hoisting.

(a) The employer shall adhere to the manufacturer's recommended ratings for safe working loads for the sizes of the wrought iron and alloy steel chains and chain slings used and shall have such ratings available. When the manufacturer is unable to provide such ratings, the employer shall use the

tables for chains and chain slings found in American National Safety Standard for Slings, ANSI B30.9-1971.

(b) Proof coil steel chain, also known as common or hardware chain, and other chain not recommended by the manufacturer for slinging or hoisting shall not be used for slinging or hoisting.

(c)(i) Sling chains, including end fastenings, shall be inspected for visible defects before each day's use and as often as necessary during use to ensure integrity of the sling.

(ii) Thorough inspections of chains in use shall be made quarterly to detect wear, defective welds, deformation, increase in length or stretch. The month of inspection shall be indicated on each chain by color of paint on a link or by other effective means.

(iii) Chains shall be removed from service when maximum allowable wear, as indicated in Table C-2, is reached at any point of link.

(iv) Chain slings shall be removed from service when stretch has increased the length of a measured section by more than five percent; when a link is bent, twisted or otherwise damaged; or when a link has a raised scarf or defective weld.

(v) Only designated persons shall inspect chains used for slinging and hoisting.

Table C-2 — Maximum Allowable Wear at Any Point of Link

Chain size		Maximum allowable wear	
Inches		Inches	(cm)
1/4 (9/32)	(0.6)	3/64	(0.1)
3/8	(1.0)	5/64	(0.2)
1/2	(1.3)	7/64	(0.3)
5/8	(1.6)	9/64	(0.4)
3/4	(1.9)	5/32	(0.4)
7/8	(2.2)	11/64	(0.4)
1	(2.5)	3/16	(0.5)
1 1/8	(2.9)	7/32	(0.6)
1 1/4	(3.2)	1/4	(0.6)
1 3/8	(3.5)	9/32	(0.7)
1 1/2	(3.8)	5/16	(0.8)
1 3/4	(4.4)	1 1/32	(0.9)

(d) Chains shall only be repaired under qualified supervision. Links or portions of chain defective under any of the criteria of WAC 296-56-60073 (9)(c) shall be replaced with properly dimensioned links or connections of material similar to that of the original chain. Before repaired chains are returned to service, they shall be tested to the proof test load recommended by the manufacturer for the original chain. Tests shall be performed by the manufacturer or shall be certified by an agency accredited for the purpose under WAC 296-56-60093. Test certificates shall be available at the terminal.

(e) Wrought iron chains in constant use shall be annealed or normalized at intervals not exceeding six months. Heat treatment certificates shall be available at the terminal. Alloy chains shall not be annealed.

(f) Kinked or knotted chains shall not be used for lifting. Chains shall not be shortened by bolting, wiring or knotting.

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Makeshift links or fasteners such as wire, bolts or rods shall not be used.

(g) Hooks, rings, links and attachments affixed to sling chains shall have rated capacities at least equal to that of the chains to which they are attached.

(h) Chain slings shall bear identification of size, grade and rated capacity.

(10) Shackles.

(a) If available, the manufacturer's recommended safe working loads for shackles shall not be exceeded. In the absence of manufacturer's recommendations, Table C-3 shall apply.

(b) Screw pin shackles used aloft in house fall or other gear, except in cargo hook assemblies, shall have their pins moused or otherwise effectively secured.





Table C-3 — Safe Working Loads for Shackles

Material size				Safe working load in 2,000 lb tons
Inches	(cm)		(cm)	
1/2	(1.3)	5/8	(1.6)	1.4
5/8	(1.6)	3/4	(1.9)	2.2
3/4	(1.9)	7/8	(2.2)	3.2
7/8	(2.2)	1	(2.5)	4.3
1	(2.5)	1 1/8	(2.9)	5.6
1 1/8	(2.9)	1 1/4	(3.2)	6.7
1 1/4	(3.2)	1 3/8	(3.5)	8.2
1 3/8	(3.5)	1 1/2	(3.8)	10.0
1 1/2	(3.8)	1 5/8	(4.1)	11.9
1 3/4	(4.4)	2	(5.1)	16.2
2	(5.1)	2 1/4	(5.7)	21.2

(c) Tables G-2 through G-5 shall be used to determine the safe working loads of various sizes and classifications of improved plow steel wire rope slings with various types of terminals. For sizes, classifications and grades not included in these tables the safe working load recommended by the manufacturer for specific, identifiable products shall be followed, however, a safety factor of not less than five shall be maintained.

TABLE G-1
MANILA ROPE

In Pounds or Tons of 2,000 Pounds

Circumference	Diameter in Inches	Single Leg	60 Degree	45 Degree	30 Degree
					
		Lbs.	Lbs.	Lbs.	Lbs.
3/4	1/4	120	204	170	120
1	5/16	200	346	282	200
1 1/8	3/8	270	467	380	270
1 1/4	7/16	350	605	493	350
1 3/8	15/32	450	775	635	450
1 1/2	1/2	530	915	798	530
1 3/4	9/16	690	1190	973	690
2	5/8	880	1520	1240	880
2 1/4	3/4	1080	1870	1520	1080
2 1/2	13/16	1300	2250	1830	1300
2 3/4	7/8	1540	2660	2170	1540
3	1	1800	3120	2540	1800
		Tons	Tons	Tons	Tons
3 1/4	1 1/16	1.0	1.7	1.4	1.0

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3 1/2	1 1/8	1.2	2.1	1.7	1.2
3 3/4	1 1/4	1.35	2.3	1.9	1.35
4	1 5/16	1.5	2.6	2.1	1.5
4 1/2	1 1/2	1.8	3.1	2.5	1.8
5	1 5/8	2.25	3.9	3.2	2.25
5 1/2	1 3/4	2.6	4.5	3.7	2.6
6	2	3.1	5.4	4.4	3.1
6 1/2	2 1/8	3.6	6.2	5.1	3.6

TABLE G-2 RATED CAPACITIES FOR IMPROVED PLOW STEEL, INDEPENDENT WIRE ROPE CORE, WIRE ROPE AND WIRE SLINGS (IN TONS OF 2,000 POUNDS)




Rope Diameter Inches	Single Leg					
	Vertical			Choker		
	A	B	C	A	B	C
6 x 19 Classification						
1/4"	.59	.56	.53	.44	.42	.40
3/8"	1.3	1.2	1.1	.98	.93	.86
1/2"	2.3	2.2	2.0	1.7	1.6	1.5
5/8"	3.6	3.4	3.0	2.7	2.5	2.2
3/4"	5.1	4.9	4.2	3.8	3.6	3.1

TABLE G-2 RATED CAPACITIES FOR IMPROVED PLOW STEEL, INDEPENDENT WIRE ROPE CORE, WIRE ROPE AND WIRE SLINGS (IN TONS OF 2,000 POUNDS)

Rope Diameter Inches	Single Leg					
	Vertical			Choker		
	A	B	C	A	B	C
7/8"	6.9	6.6	5.5	5.2	4.9	4.1
1"	9.0	8.5	7.2	6.7	6.4	5.4
1-1/8"	11	10	9.0	8.5	7.8	6.8
6 x 37 Classification						
1-1/4"	13	12	10	9.9	9.2	7.9
1-3/8"	16	15	13	12	11	9.6
1-1/2"	19	17	15	14	13	11
1-3/4"	26	24	20	19	18	15
2"	33	30	26	25	23	20
2-1/4"	41	38	33	31	29	25

(A) — Socket or Swaged Terminal attachment.
 (B) — Mechanical Sleeve attachment.
 (C) — Hand Tucked Splice attachment.

TABLE G-3 RATED CAPACITIES FOR IMPROVED PLOW STEEL, INDEPENDENT WIRE ROPE CORE, WIRE ROPE SLING (IN TONS OF 2,000 POUNDS)

Two-leg bridle or basket hitch												
Rope dia. inches	Vertical			60 Degree 			45 Degree 			30 Degree 		
	A	B	C	A	B	C	A	B	C	A	B	C
6 x 19 Classification												
1/4"	1.2	1.1	1.0	1.0	.97	.92	.83	.79	.75	.59	.56	.53
3/8"	2.6	2.5	2.3	2.3	2.1	2.0	1.8	1.8	1.6	1.3	1.2	1.1
1/2"	4.6	4.4	3.9	4.0	3.8	3.4	3.2	3.1	2.8	2.3	2.2	2.0
5/8"	7.2	6.8	6.0	6.2	5.9	5.2	5.1	4.8	4.2	3.6	3.4	3.0
3/4"	10	9.7	8.4	8.9	8.4	7.3	7.2	6.9	5.9	5.1	4.9	4.2
7/8"	14	13	11	12	11	9.6	9.8	9.3	7.8	6.9	6.6	5.5
1"	18	17	14	15	15	12	13	12	10	9.0	8.5	7.2
1 1/8"	23	21	18	19	18	16	16	15	13	11	10	9.0
6 x 37 Classification												
1 1/4"	26	24	21	23	21	18	19	17	15	13	12	10
1 3/8"	32	29	25	28	25	22	22	21	18	16	15	13
1 1/2"	38	35	30	33	30	26	27	25	21	19	17	15
1 3/4"	51	47	41	44	41	35	36	33	29	26	24	20
2"	66	61	53	57	53	46	47	43	37	33	30	26
2 1/4"	83	76	66	72	66	57	58	54	47	41	38	33

(A) Socket or Swaged Terminal Attachment.
 (B) Mechanical Sleeve Attachment.
 (C) Hand Tucked Splice Attachment.

TABLE G-4 RATED CAPACITIES FOR IMPROVED PLOW STEEL, FIBER CORE, WIRE ROPE AND WIRE ROPE SLINGS
(In Tons of 2,000 pounds)

Rope dia. Inches	Single leg					
	Vertical			Choker		
	A	B	C	A	B	C
6 x 19 Classification						
1/4	.55	.51	.49	.41	.38	.37
3/8	1.2	1.1	1.1	.91	.85	.80
1/2	2.1	2.0	1.8	1.6	1.5	1.4
5/8	3.3	3.1	2.8	2.5	2.3	2.1
3/4	4.8	4.4	3.9	3.6	3.3	2.9
7/8	6.4	5.9	5.1	4.8	4.5	3.9
1	8.4	7.7	6.7	6.3	5.8	5.0
1-1/8	10	9.5	8.4	7.9	7.1	6.3

TABLE G-4 RATED CAPACITIES FOR IMPROVED PLOW STEEL, FIBER CORE, WIRE ROPE AND WIRE ROPE SLINGS
(In Tons of 2,000 pounds)

Rope dia. Inches	Single leg					
	Vertical			Choker		
	A	B	C	A	B	C
6 x 37 Classification						
1-1/4	12	11	9.8	9.2	8.3	7.4
1-3/8	15	13	12	11	10	8.9
1-1/2	17	16	14	13	12	10
1-3/4	24	21	19	18	16	14
2	31	28	25	23	21	18

(A) — Socket or Swaged Terminal attachment.
(B) — Mechanical Sleeve attachment.
(C) — Hand Tucked Splice attachment.

TABLE G-5 RATED CAPACITIES FOR IMPROVED PLOW STEEL, FIBER CORE, WIRE ROPE SLINGS
(IN TONS OF 2,000 POUNDS)

Two-leg bridle or basket hitch

Rope dia. inches	Two-leg bridle or basket hitch											
	Vertical			60 Degree			45 Degree			30 Degree		
	A	B	C	A	B	C	A	B	C	A	B	C
6 x 19 Classification												
1/4"	1.1	1.0	.99	.95	.88	.85	.77	.72	.70	.55	.51	.49
3/8"	2.4	2.2	2.1	2.1	1.9	1.8	1.7	1.6	1.5	1.2	1.1	1.1
1/2"	4.3	3.9	3.7	3.7	3.4	3.2	3.0	2.8	2.6	2.1	2.0	1.8
5/8"	6.7	6.2	5.6	5.8	5.3	4.8	4.7	4.4	4.0	3.3	3.1	2.8
3/4"	9.5	8.8	7.8	8.2	7.6	6.8	6.7	6.2	5.5	4.8	4.4	3.9
7/8"	13	12	10	11	10	8.9	9.1	8.4	7.3	6.4	5.9	5.1
1"	17	15	13	14	13	11	12	11	9.4	8.4	7.7	6.7
1 1/2"	21	19	17	18	16	14	15	13	12	10	9.5	8.4
6 x 37 Classification												
1 1/4"	25	22	20	21	19	17	17	16	14	12	11	9.8
1 3/8"	30	27	24	26	23	20	21	19	17	15	13	12
1 1/2"	35	32	28	30	27	24	25	22	20	17	16	14
1 3/4"	48	43	38	41	37	33	34	30	27	24	21	19
2"	62	55	49	53	48	43	43	39	35	31	28	25

(A) Socket or Swaged Terminal Attachment.
(B) Mechanical Sleeve Attachment.
(C) Hand Tucked Splice Attachment.

TABLE G-6 ALLOY STEEL CHAIN
(In Tons of 2,000 Pounds)

Nominal Size Chain Stock Inch	Single Leg	60 Degree	45 Degree	30 Degree
1/4	1.62	2.82	2.27	1.62
3/8	3.30	5.70	4.65	3.30
1/2	5.62	9.75	7.90	5.62
5/8	8.25	14.25	11.65	8.25
3/4	11.5	19.9	16.2	11.5

7/8	14.3	24.9	20.3	14.3
1	19.3	33.5	27.3	19.8
1 1/8	22.2	38.5	31.5	22.2
1 1/4	28.7	49.7	40.5	28.7
1 3/8	33.5	58.0	47.0	33.5
1 1/2	39.7	68.5	56.0	39.7
1 5/8	42.5	73.5	59.5	42.5
1 3/4	47.0	81.5	62.0	47.0

(11) Hooks other than hand hooks.

(a) The manufacturer's recommendations shall be followed in determining the safe working loads of the various sizes and types of specific and identifiable hooks. All hooks for which no applicable manufacturer's recommendations are

available shall be tested to twice the intended safe working load before they are initially put into use. The employer shall maintain a record of the dates and results of such tests.

(b) Loads shall be applied to the throat of the hook since loading the point may overstress, bend, or spring the hook.

(c) Hooks shall be inspected once a month to see that they have not been bent by overloading. Bent or sprung hooks shall not be used.

(d) Crane hooks. Magnetic particle or other suitable crack detecting inspection shall be performed at least once each year. When testing by x-ray, the pertinent provisions of the Nuclear Regulatory Commission's standards for protection against radiation, relating to protection against occupational radiation exposure, shall apply.

(e) Any activity which involves the use of radioactive materials or x-rays, whether or not under license from the Nuclear Regulatory Commission, shall be performed by competent persons specially trained in the proper and safe operation of such equipment. In the case of materials used under commission license, only persons actually licensed, or competent persons under direction and supervision of the licensee, shall perform such work.

(f) Teeth of case hooks shall not be split, cracked, or deformed.

(g) Jaws of patent clamp type plate hooks shall be kept in safe condition so that they will grip plates securely.

(12) Pallets.

(a) Pallets shall be made and maintained to safely support and carry loads being handled. Fastenings of reusable pallets used for hoisting shall be bolts and nuts, drive screws (helically threaded nails), annular threaded nails or fastenings of equivalent holding strength.

(b) Damaged pallets shall be stored in designated areas and identified.

(c) Reusable wing or lip-type pallets shall be hoisted by bar bridles or other suitable gear and shall have an overhanging wing or lip of at least three inches (7.62 cm). They shall not be hoisted by wire slings alone.

(d) Loaded pallets that do not meet the requirements of this paragraph shall be hoisted only after being placed on pallets meeting such requirements or shall be handled by other means providing equivalent protection.

(e) Bridles for handling flush end or box-type pallets shall be designed to prevent disengagement from the pallet under load.

(f) Pallets shall be stacked or placed to prevent falling, collapsing or otherwise causing a hazard under standard operating conditions.

(g) Disposable pallets intended only for one use shall not be re-used for hoisting.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60073, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60073, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-56-60073, filed 1/18/95, effective 3/1/95. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60073, filed 10/30/92, effective 12/8/92. Statutory Authority: Chapter 49.17 RCW. 91-11-070 (Order 91-01), § 296-56-60073, filed 5/20/91, effective 6/20/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60073, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60073, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60073, filed 12/11/84.]

WAC 296-56-60075 Cargo boards and other type pallet boards. (1) "Cargo board" means the typical wing or lip-type stevedore board hoisted to or from vessels by means of a bar bridle. "Other pallet boards" includes all other platforms used to hold cargo for the purpose of transporting it from place to place.

(2) All pallets and cargo boards shall be of such material and construction as to safely support and carry loads being handled.

(3) All cargo boards shall be sheathed (decked) top and bottom with the top sheathing being of two-inch lumber and extending at least six inches beyond the end stringers.

(4) The outer sheathing boards or boards adjacent thereto on cargo boards shall be fastened to the stringers by bolts and nuts. Other sheathing shall be fastened by bolts and nuts, drive screws (helically threaded nails), annular threaded nails, or fastenings of equivalent strength.

(5) Pallet boards, other than cargo boards, may be hoisted if safe means are provided for the type of board used.

(6) Loaded cargo or pallet boards which do not meet the requirements of this section shall be reboarded or placed on cargo boards meeting the requirements of this section before being hoisted, only if the weight of the load can be safely distributed on the cargo board.

(7) Cargo boards which are not loaded and secured so that the load will not tip or fall shall not be hoisted.

(8) Bridles used to handle flush-end or box-type pallets shall be of such a design as to prevent them from becoming disengaged from the pallet under load.

Note: In areas where a two lip cargo board is being used, that practice shall continue. The department of labor and industries recommends the use of the two lip cargo board.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60075, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60075, filed 12/11/84.]

WAC 296-56-60077 Powered industrial trucks. (1) Applicability. This section applies to every type of powered industrial truck used for material or equipment handling within a marine terminal. Employers must comply with the provisions of WAC 296-24-230 and this section. It does not apply to over-the-road vehicles.

(2) General.

(a) Modifications, such as adding counterweights, that might affect the vehicle's capacity or safety shall not be performed without either the manufacturer's prior written approval or the written approval of a professional engineer experienced with the equipment who has consulted with the manufacturer, if available. Capacity, operation and maintenance instruction plates, tags or decals shall be changed to conform to the equipment as modified.

(b) Unauthorized personnel shall not ride on powered industrial trucks. A safe place to ride shall be provided when riding is authorized.

(c) When a powered industrial truck is left unattended, load-engaging means shall be fully lowered, controls neutralized and brakes set. Unless the truck is in view and within twenty-five feet (7.62 m) of the operator, power shall be shut off. Wheels shall be blocked or curbed if the truck is on an incline.

(d) Powered industrial trucks shall not be operated inside highway vehicles or railcars having damage which could affect operational safety.

(e) Powered industrial trucks shall be marked with their rated capacities, which shall be visible to the operator.

(f) Only stable and safely arranged loads within the rated capacity of the truck shall be handled.

(g) Drivers shall ascend and descend grades slowly.

(h) Drivers shall slow down and sound the horn at crossaisles and other locations where visibility is obstructed.

(i) If the load obstructs the forward view drivers shall travel with the load trailing.

(j) Steering knobs shall not be used unless the truck is equipped with power steering.

(k) When powered industrial trucks use cargo lifting devices that have a means of engagement hidden from the operator, a means shall be provided to enable the operator to determine that the cargo has been engaged.

(l) When cargo is being towed on pipe trucks or similar equipment, a safe means shall be provided to protect the driver from sliding loads.

(3) Maintenance.

(a) Only designated persons shall perform maintenance and repair.

(b) Batteries on all powered trucks shall be disconnected during repairs to the primary electrical system unless power is necessary for testing and repair. On trucks equipped with systems capable of storing residual energy, that energy shall be safely discharged before work on the primary electrical system begins.

(c) Replacement parts whose function might affect operational safety shall be equivalent in strength and performance capability to the original parts which they replace.

(d) Braking systems or other mechanisms used for braking shall be operable and in safe condition.

(e) Powered industrial trucks shall be maintained in safe working order. Safety devices shall not be removed or made inoperative except as otherwise provided in this section. Trucks with a fuel system leak or any other safety defect shall not be operated.

(f) Those repairs to the fuel and ignition systems of industrial trucks which involve fire hazards shall be conducted only in locations designated as safe for such repairs.

(4) Approved trucks.

(a) "Approved power-operated industrial truck" means one listed or approved for the intended use by a nationally recognized testing laboratory.

(b) Approved trucks acquired and used after February 15, 1972, shall bear a label or other identification indicating testing laboratory approval.

(c) When the atmosphere in an area is hazardous and the provisions of United States Coast Guard regulations at 33 CFR 126.15(e) do not apply, only power-operated industrial trucks approved for such locations shall be used.

(5) Duties of operator.

(a) A power-driven vehicle operator's special duties are:

(i) To operate the vehicle in a safe manner.

(ii) To test brakes, steering gear, lights, horns, or other warning devices, clutches, etc., before starting work.

(iii) To have the vehicle at all times under control so that it can be brought to an emergency stop in the clear space in front of the vehicle.

(iv) To back down any incline of two percent or more when traveling with a load on the fork lift jitney.

(b) Unobstructed view. When traveling, power-propelled vehicles shall at all times be operated in a manner giving the operator a reasonably unobstructed view in the direction of travel. Where this is impractical, the operator shall be directed in travel, by a person designated to do so.

(c) Employee riding safety. Operators and authorized passengers shall not be permitted to ride with legs or arms extending outside any vehicle nor shall they be permitted to ride while standing unless the vehicle is designed to be operated from a standing position.

(d) Moving vehicles. Vehicles shall be controlled manually while being pushed or towed except when a tow bar is used. Special precautions shall be taken when pushing vehicles where view is obstructed. Vehicles shall not be pushed with blades of a forklift.

(e) Moving highway trailers. In all cargo operations involving the use of highway trailers, trailers shall be moved in such a manner that the moving trailer is completely under control at all times. Special caution shall be exercised when such trailers are moving on inclines. Trailers shall be loaded in a manner which will prevent the cargo from shifting, and the load in the trailer shall be evenly distributed so as not to cause the trailer to tip to one side.

(f) Prohibited forms of riding. Riding on tongue or handles of trailers or forks of power-propelled vehicles is prohibited.

(g) Regular seats for riders. No one except the operator shall ride on power-driven vehicles unless regular seats are provided to accommodate passengers.

(h) Jumping on or off moving vehicles. Employees shall not jump on or off moving vehicles.

(i) Reporting defects. If a power-driven vehicle is at any time found to be in any way unsafe, the operator shall report same immediately to the person in charge and such vehicle shall not be used for production work until it has been made safe.

(6) Vehicle equipment and maintenance.

(a) Horns and lights. All power-propelled vehicles shall be provided with horns or other warning devices.

(b) Power-propelled vehicles used for night work, when required to travel away from an illuminated work area shall be equipped with a light or lights directed in the direction of travel in order to safely travel about the area.

(c) Guards on operator's platform. Every power truck operated from an end platform or standing position shall be equipped with a substantial guard securely attached to the platform or frame of the vehicle in such a manner as to protect the operator from falling objects and so designed that the operator can easily mount or dismount from the operating station.

(d) Seat cushions. All vehicles having a driver's seat shall be provided with resilient seat cushions fixed in place.

(e) Securing of counterbalances. Counterbalances of all power-driven vehicles shall be positively secured to prevent

accidental dislodging, but may be a removable type which may be removed, if desired, prior to hoisting the vehicle.

(f) Exhaust pipes and mufflers. Exhaust pipes and mufflers of internal combustion engines, where workers are exposed to contact shall be isolated or insulated. Exhaust pipes shall be constructed to discharge not less than seventy-two inches above the floor on jitneys and eighty-four inches on forklifts or less than twenty inches from the floor.

(g) Ventilation where internal combustion vehicles are used. Internal combustion engines may be used only in areas where adequate ventilation is provided.

(h) Concentration levels of carbon monoxide gas created by powered industrial truck operations shall not exceed the levels specified in WAC 296-56-60055.

(i) When disputes arise concerning degree of concentration, methods of sampling to ascertain the conditions should be referred to a qualified industrial hygienist.

(j) Cargo truck couplings. Couplings installed on cargo trucks (four-wheelers) shall be of a type which will prevent accidental disengaging.

(k) Operating levers. Operating levers on power-driven vehicles shall be so placed as not to project toward the operator's body.

(l) Front axle assembly. The front axle assembly on all trailers shall be securely fastened to the truck bed.

(m) Air line hook-up. Tractors hauling heavy duty highway trailers shall have an air line brake hook-up.

(n) Floor mats. On power-driven vehicles where the operator stands on a platform, resilient foot mats shall be securely attached.

(o) Cleaning vehicles. All power-propelled vehicles shall be cleaned at frequent intervals to remove any accumulation of dust and grease that may present a hazard.

(7) Forklift trucks.

(a) Overhead guards.

(i) When operators are exposed to overhead falling hazards, forklift trucks shall be equipped with securely attached overhead guards. Guards shall be constructed to protect the operator from falling boxes, cartons, packages, or similar objects.

(ii) Overhead guards shall not obstruct the operator's view, and openings in the top of the guard shall not exceed six inches (15.24 cm) in one of the two directions, width or length. Larger openings are permitted if no opening allows the smallest unit of cargo being handled to fall through the guard.

(iii) Overhead guards shall be built so that failure of the vehicle's mast tilting mechanism will not displace the guard.

(iv) An overhead guard, otherwise required by this paragraph, may be removed only when it would prevent a truck from entering a work space and if the operator is not exposed to low overhead obstructions in the work space.

(v) Overhead guards shall be large enough to extend over the operator during all truck operations, including forward tilt.

(b) Supplies to ship's rail. Cargo or supplies shall not be hoisted to or from ship's rail with a forklift. This does not apply to ramp or side port loading.

(c) Position of forks. When standing, lift forklift forks shall be lowered to floor. When moving, lift forklift forks shall be kept as low as possible.

(d) Forklift use in gangplank moving. Not less than two forklifts shall be used to place or remove gangplanks unless fork width prevents tipping and manufacturer's rated lifting capacity of the forklift is not exceeded.

(e) Forklift seat covers. Seats on forklifts shall be provided with a removable waterproof cover when they are exposed to the weather.

(f) Raised equipment to be blocked. Workers shall not work below the raised bed of a dump truck, raised buckets of front end loaders, raised blades of tractors or in similar positions without blocking the equipment in a manner that will prevent it from falling. When working under equipment suspended by use of jacks, safety stands or blocking shall be used in conjunction with the jack.

(g) Maximum speed. The maximum speed for forklifts on all docks shall not exceed eight miles per hour. The speed limit shall be prominently posted on such docks.

(h) Load backrest extensions. Where necessary to protect the operator, forklift trucks shall be fitted with a vertical load backrest extension to prevent the load from hitting the mast when the mast is positioned at maximum backward tilt. For this purpose, a "load backrest extension" means a device extending vertically from the fork carriage frame to prevent raised loads from falling backward.

(i) Forks. Forks, fork extensions and other attachments shall be secured so that they cannot be accidentally dislodged, and shall be used only in accordance with the manufacturer's recommendations.

(j) Counterweights. Counterweights shall be so affixed that they cannot be accidentally dislodged.

(k) Capacities and weights.

(i) Forklift truck rated capacities, with and without removable counterweights, shall not be exceeded. Rated capacities shall be marked on the vehicle and shall be visible to the operator. The vehicle weight, with and without counterweight, shall be similarly marked.

(ii) If loads are lifted by two or more trucks working in unison, the total weight of the load shall not exceed the combined rated lifting capacity of all trucks involved.

(l) Lifting of employees. Employees may be elevated by forklift trucks only when a platform is secured to the lifting carriage or forks. The platform shall meet the following requirements:

(i) The platform shall have a railing complying with WAC 296-56-60123(3).

(ii) The platform shall have toeboards complying with WAC 296-56-60123(4), if tools or other objects could fall on employees below.

(iii) When the truck has controls which are elevated with the lifting carriage, means shall be provided for employees on the platform to shut off power to the vehicle.

(iv) Employees on the platform shall be protected from exposure to moving truck parts.

(v) The platform floor shall be skid resistant.

(vi) A truck operator shall be at the truck's controls when employees are elevated unless the truck's controls are elevated with the lifting carriage.

(vii) When the truck has controls elevated with the lifting carriage, means shall be provided for employees on the platform to shut off power to the vehicle.

(viii) While employees are elevated, the truck may be moved only to make minor placement adjustments.

(8) Bulk cargo-moving vehicles.

(a) Where a seated operator may come into contact with projecting overhead members, crawler-type bulk-cargo-moving vehicles that are rider operated shall be equipped with operator guards.

(b) Guards and their attachment points shall be so designed as to be able to withstand, without excessive deflection, a load applied horizontally at the operator's shoulder level equal to the drawbar pull of the machine.

(c) After July 26, 1999, bulk cargo-moving vehicles shall be equipped with rollover protection of such design and construction as to prevent the possibility of the operator being crushed because of a rollover or upset.

(9) Straddle trucks.

(a) Accessibility. Straddle trucks shall have a permanent means of access to the operator's station, including any handholds necessary for safe ascent and descent.

(b) Guarding.

(i) Main sprockets and chains to the wheels shall be guarded as follows:

(A) The upper sprocket shall be fully enclosed;

(B) The upper half of the lower sprocket shall be enclosed; and

(C) The drive chain shall be enclosed to a height of eight feet (2.44 m) except for that portion at the lower half of the lower sprocket.

(ii) Gears shall be fully enclosed and revolving parts which may be contacted by the operator shall be guarded.

(iii) When straddle trucks are used in the vicinity of employees, personnel-deflecting guards shall be provided around leading edges of front and rear wheels.

(c) Visibility. Operator visibility shall be provided in all directions of movement.

(10) Trailer-spotting tractors.

(a) Trailer-spotting tractors (fifth wheels) shall be fitted with any hand grabs and footing necessary for safe access to the fifth wheel.

(b) Rear cab windows shall be of safety glass or equivalent material.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60077, filed 10/18/00, effective 2/1/01; 00-01-176, § 296-56-60077, filed 12/21/99, effective 3/1/00. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60077, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60077, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60077, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60077, filed 12/11/84.]

WAC 296-56-60079 General rules applicable to vehicles. (1) The requirements of this section apply to general vehicle use within marine terminals except in cases where the provisions of subsections (3) and (13) of this section are preempted by regulations of the department of transportation.

(2) Private vehicle parking in marine terminals shall be allowed only in designated areas.

(2001 Ed.)

(3) Trailers shall not be disconnected from tractors at loading docks until the road wheels have been immobilized. The road wheels shall be immobilized from the time the brake system is disconnected until braking is again provided. Supplementary front end support shall be employed as necessary to prevent tipping when a trailer is entered by a material handling vehicle. Rear end support shall be employed if rear wheels are so far forward as to allow tipping when the trailer is entered.

(4) The employer shall direct motor vehicle operators to comply with any posted speed limits, other traffic control signs or signals, and written traffic instructions.

(5) Stop signs shall be posted at main entrances and exits of structures where visibility is impaired, and at blind intersections, unless direct traffic control, warning mirror systems or other systems of equivalent safety are provided.

(6) Vehicular routes, traffic rules and parking areas shall be established, identified and used.

(7) Vehicle drivers shall warn anyone in traffic lanes of the vehicle's approach.

(8) Signs indicating pedestrian traffic shall be clearly posted at vehicular check-in and check-out lines and similar locations where employees may be working.

(9) A distance of not less than twenty feet (6.1 m) shall be maintained between the first two vehicles in a check-in, check-out, road ability, or vessel loading/discharging line. This distance shall be maintained between any subsequent vehicles behind which employees are required to work.

(10) No unattended vehicle shall be left with its engine running unless secured against movement (see WAC 296-56-60077 for powered industrial trucks).

(11) When the rear of a vehicle is elevated to facilitate loading or discharging, a ramp shall be provided and secured. The vehicle shall be secured against accidental movement during loading or discharging.

(12) Only vehicle floors in safe condition shall be used.

(13) When flatbed trucks, platform containers or similar conveyances are loaded or discharged and the cargo consists of pipe or other products which could spread or roll to endanger employees, the cargo shall be contained to prevent movement.

(14) Vehicles used to transport employees within a terminal shall be maintained in safe working order and safety devices shall not be removed or made inoperable.

[Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60079, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60079, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60079, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60079, filed 12/11/84.]

WAC 296-56-60081 Multipiece and single-piece rim wheels. Servicing of multipiece and single-piece rim wheels in marine terminal and other maritime work locations on large vehicles is regulated by requirements of WAC 296-24-21701.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-56-60081, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60081, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60081, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60081, filed 12/11/84.]

WAC 296-56-60083 Cranes and derricks. (1) Scope.

(a) This section through WAC 296-56-60103 applies to every kind of crane and derrick and to any other type of equipment performing the functions of a crane or derrick except as noted in (b) of this subsection.

(b) This section does not apply to small industrial truck-type cranes, container handling toploaders and sideloaders, chain hoists, and mobile straddle-type cranes incapable of straddling two or more intermodal containers (sixteen feet (4.88 m) in width).

(2) Ratings.

(a) Except for bridge cranes covered by subsection (7) of this section, cranes and derricks having ratings that vary with boom length, radius (outrreach) or other variables shall have a durable rating chart visible to the operator, covering the complete range of the manufacturer's (or design) capacity ratings. The rating chart shall include all operating radii (outrreach) for all permissible boom lengths and jib lengths as applicable, with and without outriggers, and alternate ratings for optional equipment affecting such ratings. Precautions or warnings specified by the owner or manufacturer shall be included.

(b) The manufacturer's (or design) rated loads for the conditions of use shall not be exceeded.

(c) Designated working loads shall not be increased beyond the manufacturer's ratings or original design limitations unless such increase receives the manufacturer's approval. When the manufacturer's services are not available or where the equipment is of foreign manufacture, engineering design analysis shall be performed or approved by a person accredited for certifying the equipment under WAC 296-56-60093. Cranes shall conform with the manufacturer's specifications or any current ANSI standards that apply. Engineering design analysis shall be performed by a registered professional engineer competent in the field of cranes and derricks. Any structural changes necessitated by the change in rating shall be carried out.

(3) Radius indicator. When the rated load varies with the boom radius, the crane or derrick shall be fitted with a boom angle or radius indicator visible to the operator.

(4) Prohibited usage.

(a) Equipment shall not be used in a manner that exerts sideloading stresses upon the crane or derrick boom.

(b) No crane or derrick having a visible or known defect that affects safe operation shall be used.

(5) Protective devices.

(a) When exposed moving parts such as gears, chains and chain sprockets present a hazard to employees during crane and derrick operations, those parts shall be securely guarded.

(b) Crane hooks shall be latched or otherwise secured to prevent accidental load disengagement.

(c) When hoisting personnel in an approved man basket, the hook shall have a positive safety latch to prevent rollouts.

(6) General.

(a) Operating controls.

(i) Crane and derrick operating controls shall be clearly marked, or a chart indicating their function shall be posted at the operator's position.

(ii) All crane controls shall operate in a uniform manner within a given port.

(iii) Overhead bridge and container gantry crane operating control levers shall be self-centering so that they will automatically move to the "off" position when the operator releases the control.

(b) Booms. Cranes with elevatable booms and without operable automatic limiting devices shall be provided with boom stops if boom elevation can exceed maximum design angles from the horizontal.

(c) Foot pedals. Foot pedals shall have a nonskid surface.

(d) Access. Ladders, stairways, stanchions, grab irons, foot steps or equivalent means shall be provided as necessary to ensure safe access to footwalks, cab platforms, the cab and any portion of the superstructure which employees must reach.

(i) Footwalks shall be of rigid construction, and shall be capable of supporting a load of one hundred pounds (4.79 kPa) per square foot.

(ii) If more than twenty feet (6.1 m) in height, vertical ladders shall comply with WAC 296-56-60209 (4), (5)(a), (5)(b)(iii) and (5)(b)(iv).

(iii) Stairways on cranes shall be equipped with rigid handrails meeting the requirements of WAC 296-56-60123 (5)(a).

(iv) If the top of a ladder or stairway or any position thereof is located where a moving part of a crane, such as a revolving house, could strike an employee ascending or descending the ladder or stairway, a prominent warning sign shall be posted at the foot of the ladder or stairway. A system of communication (such as a buzzer or bell) shall be established and maintained between the foot of the ladder or stairway and the operator's cab.

(e) Operator's station. The cab, controls, and mechanism of the equipment shall be so arranged that the operator has a clear view of the load or signal person, when one is used. Cab glass, when used, shall be safety plate glass or equivalent and good visibility shall be maintained through the glass. Clothing, tools and equipment shall be stored so as not to interfere with access, operation, or the operator's view.

(f) A seat (lap) belt, meeting the requirements of 49 CFR 571.208-210 for a Type 1 seat belt assembly, shall be installed on the operator's seat of high speed container gantry cranes where the seat trolleys.

(g) Counterweights or ballast. Cranes shall be operated only with the specified type and amount of ballast or counterweights. Ballast or counterweight shall be located and secured only as provided in the manufacturer's or design specifications, which shall be available.

(h) Outriggers. Outriggers shall be used according to the manufacturer's specifications or design data, which shall be available. Floats, when used, shall be securely attached to the outriggers. Wood blocks or other support shall be of sufficient size to support the outrigger, free of defects that may affect safety and of sufficient width and length to prevent the crane from shifting or toppling under load.

(i) Exhaust gases. Engine exhaust gases shall be discharged away from the normal position of crane operating personnel.

(j) Electrical equipment shall be so located or enclosed that live parts will not be exposed to accidental contact. Des-

igned persons may work on energized equipment only if necessary during inspection, maintenance, or repair.

(k) Fire extinguisher.

(i) At least one portable fire extinguisher of at least 5-BC rating or equivalent shall be accessible in the cab of the crane or derrick.

(ii) No portable fire extinguisher using carbon tetrachloride or chlorobromomethane extinguishing agents shall be used.

(l) Rope on drums. At least three full turns of rope shall remain on ungrooved drums, and two turns on grooved drums, under all operating conditions. Wire rope shall be secured to drums by clamps, U-bolts, shackles, or equivalent means. Fiber rope fastenings are prohibited.

(m) Assembly or disassembly of boom sections. Mobile crane booms being assembled or disassembled on the ground with or without the support of the boom harness shall be blocked to prevent dropping of the boom or boom sections.

(n) Brakes.

(i) Each independent hoisting unit of a crane shall be equipped with at least one holding brake, applied directly to the motor shaft or gear train.

(ii) Each independent hoisting unit of a crane, except worm geared hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction, shall, in addition to a holding brake, be equipped with a controlled braking means to control lowering speeds.

(iii) Holding brakes for hoist units shall have not less than the following percentage of the rated load hoisting torque at the point where the brake is applied:

(A) One hundred twenty-five percent when used with a controlled braking means.

(B) One hundred percent when used with a mechanically-controlled braking means.

(C) One hundred percent when two holding brakes are provided.

(iv) All power control braking means shall be capable of maintaining safe lowering speeds of rated loads.

(o) Each crane or derrick shall be equipped with sufficient lights to maintain five foot candles in the working area around the load hook. All crane ladders and machinery houses shall be illuminated at a minimum of two candle power.

(p) Light fixtures connected to the boom, gantry legs, or machinery house shall be provided with safety devices which will prevent the light fixture from falling in case of bracket failure.

(q) Electronic devices may be installed to prevent collision subject to approval of the accredited certification agency.

(r) On all rail gantry cranes, truck guards shall extend on the ends of the trucks, close to the top of the rail to prevent worker's feet from being caught between the rail and wheel. This subsection does not apply if rail sweeps are present.

(s) All hydraulic cylinders used to control crane booms or to provide crane stability (outriggers) shall be equipped with a pilot operated check valve or a device which will prevent the boom or outrigger from retracting in case of failure of a component of the hydraulic system.

(t) Gantry cranes shall be provided with automatic rail clamps or other devices to prevent the crane from moving when not being used or when power is off.

(7) Rail-mounted cranes (excluding locomotive types).

(a) For the purposes of this section, rail-mounted cranes include bridge cranes and portal cranes.

(b) Rated load marking. The rated loads of bridge cranes shall be plainly marked on each side of the crane and in the cab. If there is more than one hoisting unit, each hoist shall have its rated load marked on it or on its load block. Marking shall be legible from the ground level.

(c) Wind-indicating devices.

(i) Each rail-mounted bridge and portal crane located outside of an enclosed structure shall be fitted with an operable wind-indicating device.

(ii) The wind indicating device shall provide a visible or audible warning to alert the operator of high wind conditions. That warning shall be transmitted whenever the following circumstances are present:

(A) When wind velocity reaches the warning speed, not exceeding the crane manufacturer's recommendations; and

(B) When wind velocity reaches the shutdown speed, not exceeding the crane manufacturer's recommendations, at which work is to be stopped and the crane secured.

(iii) Instructions. The employer shall post operating instructions for high wind conditions in the operator's cab of each crane. Operators shall be directed to comply with these instructions. The instructions shall include procedures for responding to high wind alerts and for any coordination necessary with other cranes.

(d) Securing of cranes in high winds.

(i) When the wind reaches the crane's warning speed:

(A) Gantry travel shall be stopped; and

(B) The crane shall be readied for shutdown.

(ii) When the wind reaches the crane's shutdown speed:

(A) Any portion of the crane spanning or partially spanning a vessel shall be moved clear of the vessel if safe to do so; and

(B) The crane shall be secured against travel, using all available means of securing.

(e) The employer shall monitor local weather conditions by subscribing to a weather service or using equally effective means.

(f) Stops and bumpers.

(i) The ends of all tracks shall be equipped with stops or bumpers. If a stop engages the tread of the wheel, it shall be of a height not less than the radius of the wheel.

(ii) When more than one crane operates on the same runway or more than one trolley on the same bridge, each crane or trolley shall be equipped with bumpers or equivalent devices at adjacent ends subject to impact.

(g) Employee exposure to crane movement. When employees may be in the vicinity of the tracks, crane trucks shall be equipped with personnel-deflecting guards.

(h) Pedestrian clearance. If the track area is used for employee passage or for work, a minimum clearance of three feet (0.91 m) shall be provided between trucks or the structures of rail-mounted cranes and any other structure or obstruction. When the required clearance is not available on

at least one side of the crane's trucks, the area shall not be used and shall be marked and identified.

(i) Warning devices. Rail-mounted cranes shall be equipped with an effective audible and visible travel warning device which shall be used to warn employees who may be in the path of the moving crane.

(j) Communications.

(i) Means of communication shall be provided between the operator's cab and the base of the gantry of all rail-mounted cranes. This requirement may be met by telephone, radio, sound-signaling system or other effective methods, but not solely by hand-signaling.

(ii) All rail-mounted cranes thirty ton and above capacity shall be equipped with a voice hailing device (PA system) from the operator to the ground, audible within one hundred feet.

(k) Limit switch bypass systems shall be secured during all cargo operations. Such bypass systems shall not be used except in an emergency or during noncargo handling operations such as stowing cranes or derricks or performing repairs. When a situation requiring the use of a bypass system or the readjustment of a limit switch arises, it shall be done only under the direction of a crane mechanic.

(l) Cranes and crane operations—Scope and application. The sections of this chapter, WAC 296-56-60083 through 296-56-60099, apply to cranes, derricks, and crane operations.

(m) Signal persons. A signal person shall be required when a crane operator's visibility is obstructed. When a signal person is required to transmit hand signals, they shall be in such a position that the operator can plainly see the signals.

(n) Signals. All operators and signal persons shall use standard signals as illustrated for longshore crane operations. (See Appendices C and D, at the end of this chapter.)

(o) Signal person for power units. Where power units, such as cranes and winches are utilized and signaling is required, the operator shall be instructed as to who is authorized to give signals. The operator shall take signals only from such authorized person. In case of emergency, any worker shall be authorized to give a stop signal.

(i) No draft shall be hoisted unless the winch or crane operator can clearly see the draft itself or see the signals of any signal person associated with the operation.

(ii) Loads requiring continuous manual guidance while in motion shall be provided with tag lines.

(p) Landing loads. Persons assisting in landing a load shall face the load and use caution to prevent themselves from getting in a position where they may be caught between the load and a fixed object.

(8) Stabilizing of locomotive cranes. Loads may be hoisted by locomotive cranes only if outriggers are in place, unless means are taken to prevent the load being carried by the truck springs of the crane.

(9) Operations.

(a) Use of cranes together. When two or more cranes hoist a load in unison, a designated person shall direct the operation and instruct personnel in positioning, rigging of the load and movements to be made.

(b) Guarding of swing radius. Accessible areas within the swing radius of the body of a revolving crane shall be

physically guarded during operations to prevent an employee from being caught between the body of the crane and any fixed structure or between parts of the crane.

(c) Securing mobile crane components in transit. The crane's superstructure and boom shall be secured against rotation and carried in line with the direction of travel except when negotiating turns with an operator in the cab or when the boom is supported on a dolly. The empty hook or other attachment shall be secured.

(d) Unattended cranes. The following steps shall be taken before leaving a crane unattended between work periods:

(i) Suspended loads, such as those hoisted by lifting magnets or clamshell buckets, shall be landed unless the storage position or maximum hoisting of the suspended device will provide equivalent safety;

(ii) Clutches shall be disengaged;

(iii) The power supply shall be shut off;

(iv) The crane shall be secured against accidental travel; and

(v) The boom shall be lowered or secured against movement.

(e) Operating near electric power lines.

(i) Clearance. Unless electrical distribution and transmission lines are deenergized and visibly grounded at point of work, or unless insulating barriers not a part of or an attachment to the crane have been erected to prevent physical contact with lines, cranes may be operated near power lines only in accordance with following:

(A) For lines rated 50 kV or below, minimum clearance between the lines and any part of the crane or load shall be ten feet (3.05 m);

(B) For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be either 10 feet (3.05 m) plus 0.4 inch (10.16 mm) for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than ten feet; and

(C) In transit with no load and boom lowered, the clearance shall be a minimum of four feet (1.22 m).

(ii) Boom guards. Cage-type boom guards, insulating links or proximity warning devices may be used on cranes, but they shall not be used in place of the clearances required by subsection (9)(e)(i) of this section.

(iii) Determination of energized lines. Any overhead line shall be presumed to be energized until the owner of the line indicates that it is not energized.

(10) Protection for employees being hoisted.

(a) No employee shall be hoisted by the load hoisting apparatus of a crane or derrick except:

(i) On intermodal container spreaders, equipped in accordance with this subsection; or

(ii) In a boatswain's chair or other device rigged to prevent it from accidental disengagement from the hook or supporting member; or

(iii) On a platform meeting the following requirements:

(A) Enclosed by a railing or other means providing protection equivalent to that described in WAC 296-56-60123(3). If equipped with open railings, the platform shall be fitted with toe boards;

(B) Having a safety factor of four based on ultimate strength;

(C) Bearing a plate or permanent marking indicating maximum load rating, which shall not be exceeded, and the weight of the platform itself;

(D) Equipped with a device to prevent access doors, when used, from opening accidentally;

(E) Equipped with overhead protection for employees on the platform if they are exposed to falling objects or overhead hazards;

(F) Secured to the load line by means other than wedge and socket attachments, unless the free (bitter) end of the line is secured back to itself by a clamp placed as close above the wedge as possible.

(b) Except in an emergency, the hoisting mechanism of all overhead and container gantry cranes used to hoist personnel shall operate in power up and power down, with automatic brake application when not hoisting or lowering.

(c) Variable radius booms of a crane or derrick used to hoist personnel shall be so constructed or secured as to prevent accidental boom movement.

(d) Platforms or devices used to hoist employees shall be inspected for defects before each day's use and shall be removed from service if defective.

(e) Employees being hoisted shall remain in continuous sight of and communication with the operator or signal person.

(f) Operators shall remain at the controls when employees are hoisted.

(g) Cranes shall not travel while employees are hoisted, except in emergency or in normal tier to tier transfer of employees during container operations.

(h) When intermodal container spreaders are used to transfer employees to or from the tops of containers, the spreaders shall be equipped with a personnel platform equipped with fixed railings, provided that the railings have one or more openings for access. The openings shall be fitted with a means of closure, such as chains with hooks. Existing railings shall be at least thirty-six inches (0.91 m) in height. New railings installed after October 3, 1983 shall be forty-two inches (1.07 m), plus or minus three inches (7.62 cm), in height. The provisions of (a)(iii)(C), (D), and (F) of this subsection also apply to personnel platforms when container spreaders are used.

(i) Positive safety latch-type hooks or moused hooks shall be used.

(j) Employees shall not be hoisted on intermodal container spreaders while a load is engaged.

Additional requirements are located in WAC 296-24-23533.

(11) Routine inspection.

(a) Designated persons shall visually inspect each crane and derrick on each day of use for defects in functional operating components and shall report any defect found to the employer. The employer shall inform the operator of the findings.

(b) A designated person shall thoroughly inspect all functional components and accessible structural features of each crane or device at monthly intervals.

(c) Any defects found during such inspections which may create a safety hazard shall be corrected before further use. Repairs shall be performed only by designated persons.

(d) A record of monthly inspections shall be maintained for six months in or on the crane or derrick or at the terminal.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60083, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60083, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-56-60083, filed 1/18/95, effective 3/1/95. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60083, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60083, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60083, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60083, filed 12/11/84.]

WAC 296-56-60085 Crane load and limit devices. (1) Except as provided in subsection (8) of this section, every crane shall be fitted with a load indicating device or alternative device in proper working condition.

The type or model or any load indicating or alternate device which is used shall provide:

(a) A direct indication in the cab of actual weight hoisted or a means of determining this by referencing a weight indication to crane ratings posted and visible to the operator. The use of a dynamometer or simple scale alone shall not meet this requirement; or

(b) Indications in the cab according to the radius and load at the moment; or

(c) A direct means to prevent an overload from occurring.

(2) Accuracy of the devices required by this section shall be such that any indicated load (or limit), including the sum of actual weight hoisted and additional equipment or "add ons" such as slings, sensors, blocks, etc., is within the range from no less than ninety-five percent of the actual true total load (five percent overload) to one hundred ten percent of the actual true total load (ten percent underload). Such accuracy shall be required over the range of the daily operating variables to be expected under the conditions of use.

(3) The device shall permit the operator to determine, before making any lift, that the indicating or substitute system is operative. In the alternative, if a device is so mounted or attached to preclude such a determination, it may not be used unless it has been certified by the manufacturer to remain operable within the limits stated in subsection (2) of this section for a specific period of use. Checks for accuracy, using known values of load, shall be performed at the time of every certification survey (see WAC 296-56-60093) and at such additional times as may be recommended by the manufacturer.

(4) When a load indicating device or alternative system is so arranged in the supporting system (crane structure) that its failure could cause the load to be dropped, its strength shall not be the limiting factor of the supporting system (crane structure).

(5) Marking shall be conspicuously placed giving: Units of measure in pounds or both pounds and kilograms, capacity of the indicating system, accuracy of the indicating system, and operating instructions and precautions. In the case of systems utilizing indications other than actual weights, the mark-

ing shall include data on: The means of measurement, capacity of the system, accuracy of the system, operating instructions and precautions. If the system used provides no read-out, but it is such as to automatically cease crane operation when the rated load limit under any specific condition of use is reached, marking shall be provided giving the make and model of the device installed, a description of what it does, how it is operated, and any necessary precautions regarding the system. All weight indications, other types of loading indications, and other data required shall be readily visible to the operator.

(6) All load indicating devices shall be operative over the full operating radius. Overall accuracy shall be based on actual applied load and not on full scale (full capacity) load.

Explanatory note. For example, if accuracy of the load indicating device is based on full scale load and the device is arbitrarily set at plus or minus ten percent, it would accept a reading between ninety thousand and one hundred ten thousand pounds, at full capacity of a machine with one hundred thousand pounds, maximum rating, but would also allow a reading between zero and twenty thousand pounds, at that outreach (radius) at which the rating would be ten thousand pounds capacity—an unacceptable figure. If, however, accuracy is based on actual applied load under the same conditions, the acceptable range would remain the same with the one hundred thousand pound load but becomes a figure between nine thousand and eleven thousand pounds, a much different and acceptable condition, at the ten thousand pound load.

(7) When the device uses the radius as a factor in its use or in its operating indications, the indicated radius (which may be in feet and/or meters, or degrees of boom angle, depending on the system used) shall be a figure which is within the range of a figure no greater than one hundred ten percent of the actual radius to a figure which is no less than ninety-seven percent of the actual (true) radius. A conversion chart shall be provided whenever it is necessary to convert between degrees of radius and feet or meters.

(8) The load indicating device requirements of this section do not apply to a crane:

(a) Of trolley equipped bridge type while handling container known to be and identified as empty, or loaded, and in either case in compliance with the provisions of WAC 296-56-60103, or while hoisting other lifts by means of a lifting beam supplied by the crane manufacturer for the purpose, and in all cases within the crane rating;

(b) While handling bulk commodities or cargoes by means of clamshell bucket or magnet;

(c) While used to handle or hold hoses in connection with transfer of bulk liquids or other hose handled products; or

(d) While the crane is used exclusively to handle cargo or equipment the total actual gross weight of which is known by means of marking of the unit or units hoisted, when such total actual gross weight never exceeds eleven thousand two hundred pounds, and when eleven thousand two hundred pounds, is less than the rated capacity of the crane at the maximum outreach that is possible under the conditions of use at the time.

(9) Limit switches shall be installed on the main line and whip line assemblies, of all cranes and derricks, which will deactivate the hoisting power when a load reaches the upper limits of travel and at such other places as required by this chapter. Line limit switches shall be tested prior to or at the beginning of each shift to determine if they are functioning properly. Any malfunction shall be reported to the person in charge immediately and shall be repaired prior to use.

[Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60085, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60085, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60085, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60085, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60085, filed 12/11/84.]

WAC 296-56-60087 Winches. (1) Moving winch parts which present hazards to employees shall be guarded.

(2) Winches shall have clearly identifiable and readily accessible stop controls.

(3) Portable winches shall be secured against accidental shifting while in use.

(4) Portable winches shall be fitted with limit switches if employees have access to areas from which it is possible to be drawn into the winch.

(5) The provisions of WAC 296-56-60083 (6)(l) apply to winches.

[Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60087, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60087, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60087, filed 12/11/84.]

WAC 296-56-60089 Conveyors. (1) Guards.

(a) Danger zones at or adjacent to conveyors shall be guarded to protect employees.

(b) An elevated walkway with guardrail or equivalent means of protection shall be provided where employees cross over moving conveyors. Suitable guarding shall be provided when employees pass under moving conveyors.

(2) Moving parts. Conveyor rollers and wheels shall be secured in position.

(3) Positioning. Gravity conveyor sections shall be firmly placed and secured to prevent them from falling.

(4) Braking.

(a) When necessary for safe operation, provisions shall be made for braking objects at the delivery end of the conveyor.

(b) Conveyors using electrically released brakes shall be constructed so that the brakes cannot be released until power is applied, and the brakes are automatically engaged if the power fails or the operating control is returned to the "stop" position.

(5) Stability. Portable conveyors shall be stable within their operating ranges. When used at variable fixed levels, the unit shall be secured at the operating level.

(6) Emergency stop devices. Readily accessible stop controls shall be provided for use in an emergency whenever employees are required to walk or work in the vicinity of the conveyor. The emergency stop device shall be available within easy reach from any position on or adjacent to the conveyor.

(7) Starting powered conveyors. Powered conveyors shall not be started until all employees are clear of the conveyor or have been warned that the conveyor is about to start.

(8) Loading and unloading. The area around conveyor loading and unloading points shall be kept clear of obstructions during conveyor operations.

(9) Lockout/tagout.

(a) Conveyors shall be stopped and their power sources locked out and tagged out during maintenance, repair, and servicing, unless power is necessary for testing.

(b) The starting device shall be locked out and tagged out in the stop position before an attempt is made to remove the cause of a jam or overload of the conveying medium, unless it is necessary to have the power on to remove the jam.

(10) Chutes, gravity conveyors and rollers.

(a) Chutes used in the manual handling of cargo shall be adequate for the use to which they are put and shall be kept free of splinters and sharp edges.

(b) Chutes shall be equipped with sideboards of sufficient height to prevent cargo from falling off.

(c) Chutes and gravity roller sections shall be firmly placed or secured to prevent displacement.

(d) Gravity rollers shall be of sufficient strength for the weight of material which is placed upon them. Rollers shall be locked in position to prevent them from falling or jumping out of the frame.

(e) Frames shall be kept free of burrs and sharp edges.

(f) When necessary, provision shall be made for braking objects at the delivery end of the roller or chute.

(11) Safe practices.

(a) Only designated persons shall operate, repair or service powered conveyors.

(b) The employer shall direct employees to stay off operating conveyors.

(c) Conveyors shall be operated only with all overload devices, guards and safety devices in place and functional.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60089, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60089, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60089, filed 12/11/84.]

WAC 296-56-60091 Spouts, chutes, hoppers, bins, and associated equipment. (1) Standing and running rigging and associated gear used as a permanent part of spouts, chutes or similar devices shall be inspected before each use and shall not be used if it has any functional defects. (See WAC 296-56-60093 for certification requirements.)

(2) Direct communication shall be provided between the discharge or shipboard control end of loading spouts or chutes, and the point in the terminal from which the flow of cargo is controlled.

(3) Chute and hopper openings which present a hazard shall be guarded to prevent employees from falling through.

(4) When employees are working on hoppers, the hopper shall be equipped with a safe walkway and safe means of access.

(5) When necessary for the safety of employees, chutes shall be equipped with sideboards to afford protection from falling objects.

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(6) Chutes shall be firmly placed and secured to prevent them from falling.

(7) When necessary for the safety of employees, provisions shall be made for braking objects other than bulk commodities at the delivery end of the chute.

(8) Before an employee enters an empty bin:

(a) Personnel controlling the flow of cargo into the bin shall be notified of the entry; and

(b) The power supply to the equipment carrying the cargo to the bin shall be turned off, locked out and tagged.

(9) Before an employee enters a bin containing a bulk commodity such as coal or sugar, the employer shall ensure that:

(a) Personnel controlling the flow of cargo into the bin shall be notified of the entry;

(b) The power supply to the equipment carrying the cargo to the bin shall be turned off, locked out and tagged;

(c) The employee entering the bin shall wear a life-line and safety harness; and

(d) A standby attendant equipped to perform a rescue shall be continuously stationed outside the bin until the employee has left the bin.

(10) Bin top openings that present a hazard to employees shall be covered to prevent employees from falling into bins.

(11) Chutes and hoppers shall be repaired only by designated persons.

(12)(a) Before power shoveling operations begin, a designated person shall inspect the equipment to be used. The inspection shall include at least the eye bolts, wires, and sheaves.

(b) Power shovels and associated equipment with defects affecting safe operation shall not be used.

(c) Before adjustments are made to a power shovel, wire, or associated equipment, the power supply to the shovel shall be turned off, locked out, and tagged, the belt stopped, and the hopper closed.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60091, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60091, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60091, filed 12/11/84.]

WAC 296-56-60093 Certification of marine terminal material handling devices. (1) The employer shall not use any material handling device listed in WAC 296-56-60098(8) until he/she has ascertained that the device has been certified, as evidenced by current and valid documents attesting to compliance with the requirements of WAC 296-56-60097 and 296-56-60098.

(2) Certification surveys are to be completed for the conditions of use found at the time such surveys are performed. Equipment owners or users may change the configurations of the equipment according to the manufacturer's specifications without affecting the established certification status for the equipment.

(3) These rules apply to employment within a marine terminal including the loading, unloading, movement, or other handling of cargo, ship's stores, or gear within the terminal or into or out of any land carrier, holding or consolidation area, or any other activity within and associated with the overall

operation and functions of the terminal, such as the use and routine maintenance of facilities and equipment.

(4) Inspection and test certificates shall be issued only for that equipment which meets or exceeds the requirements specified in these rules. All inspection and test certificates shall be issued through the office of the assistant director of the division of consultation and compliance, department of labor and industries, and shall be valid for a period not to exceed one year from the date of issuance.

(5) Equipment requiring certification shall be inspected by individuals who have received a "certificate of competency" from the assistant director, division of WISHA services indicating that they are qualified and capable of performing such work.

(6) When deficiencies are found they shall be noted on forms provided for such purpose by the division of consultation and compliance. Copies shall be delivered to the owner of the equipment and the division of consultation and compliance at the headquarter's office by the person conducting such tests or inspections.

(7) A certificate of unit test or examination of equipment shall not be issued for any equipment found not to be in compliance with the provisions of this chapter.

(8) Persons desiring a "certificate of competency" shall demonstrate and document their capabilities and qualifications to the assistant director of the division of consultation and compliance, who will issue certificates to those persons who have demonstrated competency. The assistant director reserves the right to revoke such certificates at any time for cause. A "certificate of competency" shall be issued for a period of not more than three years. Applications for renewal may be made not more than sixty days prior to the expiration date shown on the certificate.

(9) The assistant director of the division of consultation and compliance or his/her representative, reserves the right to inspect such equipment or to witness or attend any test or inspection in order to ascertain the adequacy of any certification activity performed.

(10) Unless otherwise exempted, all cranes or derricks required to be certified by these regulations shall have a current test certificate posted in the operator's cab or station. No person shall operate such crane or derrick unless a current valid certificate is posted.

[Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60093, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-56-60093, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60093, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60093, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60093, filed 12/11/84.]

WAC 296-56-60095 Advisory crane certification panel.

(1) Any person desiring a certificate of competency for crane inspection or certification shall make application to the assistant director of the division of consultation and compliance for the certificate of competency. The application shall include documentation of all qualifications, including all past experience, education, training and any other factors deemed to be relevant to the application.

(2) The advisory crane certification panel shall assist the assistant director of the division of consultation and compliance in his/her duties under this chapter. The panel shall con-

sist of six members. Two members shall represent labor, two members shall represent management, and one member shall be a crane expert. The sixth member shall be chair of the panel. He/she shall be the assistant director of consultation and compliance or his/her designee. The panel shall be responsible for advising the assistant director as to the issuance of any certificate of competency. The panel shall review all applications for certificates of competency. Minutes of meetings shall be kept.

(3) In addition, the panel shall, upon request by the assistant director, render advice concerning any matter which is relevant to crane safety. The panel shall meet twice yearly or more often as deemed necessary by the chairman of the panel. Any panel member who is not an employee of the state of Washington shall serve voluntarily.

[Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-56-60095, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60095, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60095, filed 12/11/84.]

WAC 296-56-60097 Unit proof load test and inspection.

Cranes and derricks shall be proof load tested, rated and certified in tons (2,000 lbs.= 1 ton). Cranes and derricks shall be inspected and unit proof load tested prior to being put into use, after any significant modification or repairs of structural parts, or when deemed necessary by the assistant director of consultation and compliance or his/her designee. However, each crane or derrick shall be unit proof load tested at least once during each twelve-month period. Unit proof load tests shall be carried out by the use of weights as a dead load. When use of weights for unit proof load tests is not possible or reasonable a dynamometer or other recording test equipment may be used. Such equipment shall be tested for accuracy with certified calibrating equipment within twelve months prior to being used and a copy of the certified calibration test shall be made available to authorized representatives of the division of consultation and compliance upon request.

The weight of the objects used for a dead load weight test shall be certified and a record of the weight shall be made available upon request. Any replacements or repairs deemed necessary by the person conducting a test shall be carried out before application of the required proof load unit test.

(1) The proof load tests for derricks shall be conducted as follows:

Safe Working Load	Proof Load
to 20 tons	25% in excess
20-50 tons	5 tons in excess
over 50 tons	10% in excess of manufacturer's recommended lifting capacity.

Proof load shall be applied at the designed maximum and minimum boom angles or radii, or if this is impractical, as close to these as practical. The angles or radii of test shall be stated in the certificate of test. Proof loads shall be swung as far as possible in all directions. The weight of auxiliary handling devices such as spreader bars, robots, clams, magnets, or other gear shall be considered a part of the load. Brakes shall be tested by holding the proof load suspended without other mechanical assistance. After satisfactory completion of a unit proof load test the derrick and all component parts

thereof shall be carefully examined and nondestructive tests may be conducted to assure that the equipment is safe for use and has not been damaged in the unit proof load testing process.

(2) Unit proof load tests for cranes shall be carried out with the boom in the least stable direction relative to the mounting, based on the manufacturer's specifications.

Unit proof load tests for cranes shall be based on the manufacturer's load ratings for the conditions of use and shall, except in the case of bridge type cranes utilizing a trolley, consist of application of a proof load of ten percent in excess of the load ratings at maximum and minimum radius, and at such intermediate radii as the certifying authority may deem necessary in the circumstances. (The manufacturer's load ratings are usually based upon percentage of tipping loads under some conditions and upon limitations of structural competence at others, as well as on other criteria such as type of crane mounting, whether or not outriggers are used, etc. Some cranes utilizing a trolley may have only one load rating assigned and applicable at any outreach. It is important that the manufacturer's ratings be used.) Trolley equipped cranes shall be subject to a proof load of twenty-five percent in excess of the manufacturer's load rating. In cases of foreign manufacture, the manufacturer's specifications shall be subject to approval by the certifying authority. The weight of all auxiliary handling devices such as magnets, hooks, slings, and clamshell buckets shall be considered part of the load.

(3) If the operation in which equipment is engaged never utilizes more than a fraction of the safe working load rating, the owner of the equipment may, at his/her option, have the crane or derrick certified for and operated at a lesser maximum safe working load in keeping with the use and based on radius and other pertinent factors, however, the equipment concerned shall be physically capable of operation at the original load rating and the load reduction shall not be for the purpose of avoiding correction of any deficiency.

(4) Safe working load ratings shall not be increased beyond the manufacturer's ratings or original design limitations without prior approval by the accredited certification agency. Such prior approval shall be based on the manufacturer's approval of such increase or documented engineering design analysis or both. All necessary structural changes shall be completed prior to approval by the accredited certification agency.

[Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60097, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-56-60097, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60097, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60097, filed 12/11/84.]

WAC 296-56-60098 Examination and inspection of cranes and derricks. (1) An examination shall be carried out in conjunction with each annual unit proof load test. The accredited person, or their authorized representative, shall make a determination as to correction of deficiencies found. The examination shall include the following: (Refer to WAC 296-56-60093(8) for definition of accredited person.)

(a) All functional operating mechanisms shall be examined for improper function, maladjustment, and excessive component wear, with particular attention to sheaves, pins,

and drums. The examinations shall include operation with partial load, in which all functions and movements, including maximum possible rotation in both directions, are checked.

(b) All safety devices shall be examined for malfunction.

(c) Lines, tanks, valves, drains, pumps, and other parts of air or hydraulic systems shall be examined for deterioration or leakage.

(d) Rope reeving shall comply with the manufacturer's recommendations.

(e) Deformed, cracked, or excessively corroded members in crane structure and boom shall be repaired or replaced as necessary.

(f) Loose bolts, rivets, or other connections shall be corrected.

(g) Worn, cracked, or distorted parts affecting safe operation shall be corrected.

(h) All brakes, used to control the load, boom or travel of the crane, shall be tested. Air, hydraulic, or electrically operated brakes shall be of such design as to set and stop the load if the source of power fails.

(i) Brake and clutch system parts, linings, pawls, and ratchets shall be examined for excessive wear and free operation.

(j) Load, boom angle, or other indicators shall be checked over their full range. Defects in such indicators shall be immediately corrected.

(k) Where used, clamshell buckets or other similar equipment, such as magnets, shall be carefully examined in all respects, with particular attention to closing line wires and sheaves. The accredited person may supplement such examination by requesting any operational tests deemed appropriate.

(l) Careful examination of the junction areas of removable boom sections, particularly for proper seating, cracks, deformities, or other defects in securing bolts and in the vicinity of such bolts, shall be made.

(m) All platforms, steps and footwalks located on cranes where workers are exposed to the hazard of slipping shall be of a nonslip material. Wire rope used for railings on cranes shall be kept taut at all times.

Note: In critical areas such as footwalks along booms, a grating material should be used.

(n) No counterweights in excess weight of the manufacturer's specifications shall be fitted or used.

(o) Such other examination or supplemental functional tests shall be made as may be deemed necessary by the accredited person under the circumstances.

(2) Wire rope.

(a) All wire rope shall be inspected at least once a month, dependent upon conditions to which the wire ropes are subjected, and at intervals not exceeding a twelve-month period. Records of inspection of wire rope shall be kept and shall be available to the department of labor and industries representative. Records shall be kept for one year. Refer to the general safety and health standards, WAC 296-24-24013.

(b) Wire rope shall not be used if in any length of eight diameters, the total number of visible broken wires exceeds ten percent of the total number of wires, or if the rope shows other signs of excessive wear, corrosion, or defect. Particular

attention shall be given to the condition of those sections of wire rope adjacent to any terminal connections, those sections exposed to abnormal wear, and those sections not normally exposed for examination.

(c) Documentation available for inspection shall include wire rope test certificates relating to any replacements made since the last unit test or annual examination as required.

(d) Wire rope and replacement wire rope shall be of the same size, same or better grade, and same construction as originally furnished by the equipment manufacturer or contemplated in the design, unless otherwise recommended by the equipment or wire rope manufacturer due to actual working conditions. In the absence of specific requirements, wire rope shall be of a size and construction suitable for the purpose, and shall have the capacity to handle five times the heaviest expected load, verified by wire rope test certificate.

(e) Wire rope in use on equipment previously constructed and prior to initial certification of said equipment shall not be required to be tested but shall be subject to thorough examination at the time of initial certification of the equipment.

(3)(a) Accessory components. Container spreader bar twist locks shall be carefully examined periodically and at the time of annual examination and inspection. Cracked or deformed hooks shall be discarded immediately and not used.

(b) Crane hooks and container spreader bar twist lock. Magnetic particle or other suitable crack detecting inspection shall be performed at least once each year. When testing by x-ray, the pertinent provisions of the Nuclear Regulatory Commission's standards for protection against radiation, relating to protection against occupational radiation exposure, shall apply.

(4) In the event that heat treatment of any loose gear is recommended by the manufacturer, the latest heat treatment certificate attesting to compliance with the manufacturer's specifications shall be part of the available documentation. Heat treatment shall be carried out in accordance with the specifications of the manufacturer by persons competent to perform such work.

(5) Replacement parts shall be of equal or better quality than the original equipment and suitable for the purpose. Repairs or modifications shall be such as to render the equipment equal to or better than the original construction or design.

(6) In cases of foreign manufactured cranes, there shall be an owner's warranty that the design is adequate for the intended use. The warranty shall be based on a thorough examination of the design specifications by a registered professional engineer familiar with the equipment.

(7) The certifications required by this section shall be performed in accordance with WAC 296-56-60093 by persons accredited by the assistant director of WISHA services.

(8) The marine terminal material handling devices listed below shall be certified in the following manner:

(a) Each crane and derrick shall be tested and examined as a unit annually. A copy of the certificate of tests and examinations shall be posted in the crane operator's cab.

(b) Bulk cargo spouts and suckers, together with any portable extensions and rigging or outriggers supporting them

vertically, shall be examined annually. Certificates attesting to the required examination shall be made readily available for inspection.

(c) Vertical pocket or bucket conveyors such as banana, sugar, and grain marine legs (other than those within a grain elevator structure) used within a marine terminal facility shall be examined annually. The annual examination shall include all supporting structures, rigging, mechanical components and observation of all steps of operations. Certificates attesting to the required examinations shall be readily available for inspection.

(d)(i) House fall cargo-handling gear shall be proof load tested as a unit upon initial certification and every fourth year thereafter. An examination shall be carried out in conjunction with each unit proof load test and annually thereafter. The unit test shall consist of a proof load of twenty-five percent in excess of the rated safe working load. Examinations shall include all supporting structures and components. Certificates attesting to the required tests and examinations shall be readily available for inspection.

(ii) House fall span beams or other house fall block supports shall be marked with the safe working load, which shall not be exceeded.

(e) Special gear.

(i) Special stevedoring gear provided by the employer, the strength of which depends upon components other than commonly used stock items such as shackles, ropes or chains, shall be tested as a unit in accordance with the following table before initially being put into use (see Table A). In addition, any special stevedoring gear that suffers damage necessitating structural repair shall be inspected and retested after repair and before being returned to service.

Table A	
Safe Working Load	Proof Load
Up to 20 short tons	25 percent in excess
Over 20 to 50 short tons	5 short tons in excess
Over 50 short tons	10 percent in excess

(ii) Special stevedoring gear provided by the employer that has a SWL of five short tons (10,000 or 4.54 metric tons) or less shall be inspected and tested as a unit before initial use according to (d) and (e) of this subsection or by a designated person (see Table A).

(iii) Every spreader not a part of ship's gear and used for hoisting intermodal containers shall be tested to a proof load equal to twenty-five percent in excess of its rated capacity. Additionally, any spreader which suffers damage necessitating structural repair shall be retested after repair and before being returned to service.

(iv) Certificates attesting to the required tests shall be available for inspection.

(v) All cargo handling gear covered by this section with a SWL greater than five short tons (10,000 lbs. or 4.54 metric tons) shall be proof load tested according to Table A every four years in accordance with subsection (7) of this section or by a designated person.

(f) Wire rope and loose gear used for material handling shall be tested and certified before being placed into use in accordance with the provisions of WAC 296-56-60097. Cer-

tificates attesting to the required tests, inspections and examinations shall be available.

(9) Disassembly and reassembly of equipment does not require recertification of the equipment provided that the equipment is reassembled and used in a manner consistent with its certification.

(10) Equipment certified in Washington and transferred to a site in another state does not require recertification in this state upon its return, until the next inspection or examination becomes due as if it had not been moved.

(11) Certification procedures shall not be construed as a substitute for, or cause for elimination of, normal operational inspection and maintenance routine throughout the year.

(12)(a) Every unit of equipment requiring annual certification shall have had such annual certification within the previous twelve months. Equipment requiring annual certification shall have had such annual certification within the previous twelve months, except that no annual certification is required within twelve months after any required certification. Annual examinations for certification may be accomplished up to one month early without effect on subsequent due dates.

(b) When certified equipment is out of service for six months or more beyond the due date of a certification inspection, an examination equivalent to an initial certification, including unit proof load test, shall be performed before the equipment re-enters service.

(13) Loose gear shall bear a legible mark indicating that it has been tested (see WAC 296-56-60097). Single sheave blocks shall be marked with safe working loads and proof test loads. Marks relating to testing shall be identifiable on the related certificates, which shall be available.

(14) The certification requirements of this section do not apply to the following equipment:

(a) Industrial trucks and small industrial crane trucks; and

(b) Any straddle truck not capable of straddling two or more intermodal containers sixteen feet (4.88 m) in width.

(15) Safe working load.

(a) The safe working load of gear as specified in this section shall not be exceeded.

(b) All cargo handling gear provided by the employer with a safe working load greater than five short tons (10,000 lbs. or 4.54 metric tons) shall have its safe working load plainly marked on it.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60098, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60098, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-56-60098, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60098, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60098, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60098, filed 12/11/84.]

WAC 296-56-60099 Hand tools. (1) Hand tools used by employees shall be maintained in safe operating condition.

(2)(a) Hand-held portable electric tools shall be equipped with switches that must be manually held in a closed position to operate the tool.

(b) Portable power-driven circular saws shall be equipped with guards above and below the base plate or shoe.

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The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc needed to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc needed to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

(3) Only cutting tools shall be used to cut metal strapping or banding used to secure cargo.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-56-60099, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60099, filed 12/11/84.]

PART F—SPECIALIZED TERMINALS

WAC 296-56-60101 General. The provisions of this part apply to specialized terminals.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60101, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60101, filed 12/11/84.]

WAC 296-56-60103 Terminals handling intermodal containers or roll-on roll-off operations. (1) Every intermodal container shall be legibly and permanently marked with:

(a) The weight of the container when empty, in pounds;

(b) The maximum cargo weight the container is designed to carry, in pounds; and

(c) The sum of the maximum weight of the container with cargo, in pounds (gross container capacity).

(2) No container shall be hoisted by any crane or derrick unless the following conditions have been met:

(a) The employer shall ascertain from the carrier whether a container to be hoisted is loaded or empty. Empty containers shall be identified before loading or discharge in such a manner as will inform every supervisor and foreman on the site and in charge of loading or discharging, and every crane or other hoisting equipment operator and signalman, if any, that the container is empty. Methods of identification may include cargo plans, manifests or markings on the container.

(b) In the case of a loaded container:

(i) The actual gross weight shall be plainly marked so as to be visible to the crane operator, other hoisting equipment operator, signalman, and to every supervisor and foreman on the site and in charge of the operation; or

(ii) The cargo stowage plan or equivalent permanently recorded display serving the same purpose, containing the actual gross weight and the serial number or other positive identification of that specific container, shall be provided to the crane or other hoisting equipment operator and signalman, if any, and to every supervisor and foreman on the site and in charge of the operation.

(c) Every outbound loaded container which is received at a marine terminal ready to load aboard a vessel without further consolidation or loading shall be weighed to obtain the actual gross weight before being hoisted.

(d)(i) When container weighing scales are located at a marine terminal, any outbound container with a load consolidated at that terminal shall be weighed to obtain an actual weight before being hoisted.

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(ii) If the terminal has no scales, the actual gross weight may be calculated on the basis of the container's contents and the container's empty weight. The weights used in the calculation shall be posted conspicuously on the container, with the name of the person making the calculation and the date.

(iii) Container weights shall be subject to random sample weight checks at the nearest weighing facility. In cases where such weight checks or experience otherwise indicate consistently inaccurate weights, the weight of containers so calculated at the source from which the inaccurate weights originated shall no longer be recognized as true gross weights. Such containers shall not be hoisted unless actual gross weights have been obtained by weighing.

(e) The following containers are exempted from the requirements of (c) and (d) of this subsection:

(i) Open type vehicle containers.

(ii) The container is marked on the outside in such a manner that an employee can readily discern that the container is carrying vehicles.

(iii) Containers built specifically for the carriage of compressed gases.

(iv) The container carries only completely assembled vehicles and no other cargo.

(v) The vehicles were loaded into the container at the marine terminal.

(f) The weight of loaded inbound containers from foreign ports shall be determined by weighing or by the method of calculation described in (d)(ii) of this subsection or by shipping documents.

(g) Any scale used within Washington state to weigh containers for the purpose of the requirements of this section shall meet the accuracy standards of the state or local public authority in which the scale is located.

(3) No container shall be hoisted if its actual gross weight exceeds the weight marked as required in subsection (1)(c) of this section, or if it exceeds the capacity of the crane or other hoisting device intended to be used.

(4)(a) Marked or designated areas shall be set aside within a container or roll-on roll-off terminal for passage of employees to and from active cargo transfer points, except where transportation to and from those points is provided by the employer.

(b) The employer shall direct employees to stay clear of the area beneath a suspended container. Employees shall stay clear of the area beneath a suspended container.

(5) Each employee working in the immediate area of container handling equipment or in the terminal's traffic lanes shall wear a high visibility vest (or equivalent protection).

Note to subsection (5): High visibility vests or equivalent protection means high visibility/retroreflective materials which are intended to provide conspicuity of the user by day through the use of high visibility (fluorescent) material and in the dark by vehicle headlights through the use of retroreflective material. The minimum area of material for a vest or equivalent protection is .5m(2)(760 in.(2)) for fluorescent (background) material and .13m(2)(197 in.(2)) for retroreflective material. Vests or equivalent protection, such as high visibility/retro-reflective coveralls, that are available for industrial use, may also be acceptable.

(6) Containers shall be handled using lifting fittings or other arrangements suitable and intended for the purposes as set forth in (a) and (c) of this subsection, unless when damage to an intermodal container makes special means of handling necessary.

(a) Loaded intermodal containers of twenty feet (6.1 m) or more in length shall be hoisted as follows:

(i) When hoisting by the top fittings, the lifting forces shall be applied vertically from at least four top fittings or by means which will safely lift the container without damage. The lifting fittings provided shall be used.

(A) The container being lifted is an ISO closed box container;

(B) The condition of the box is sound;

(C) The speed of hoisting and lowering is moderated when heavily laden containers are encountered;

(D) The lift angle is at eighty to ninety degrees;

(E) The distance between the lifting beam and the load is at least eight feet and 2.4 inches (2.5m); and

(F) The length of the spreader beam is at least 16.3 feet (5 m) for a twenty-foot container, and at least 36.4 feet (11.1 m) for a forty-foot container.

(ii) If hoisted from bottom fittings, the hoisting connections shall bear on the fittings only, making no other contact with the container. The angles of the four bridle legs shall not be less than thirty degrees to the horizontal in the case of forty foot (12.2 m) containers, thirty-seven degrees in the case of thirty foot (9.1 m) containers, or forty-five degrees in the case of twenty foot (6.1 m) containers.

(iii) Lifting containers by fork lift trucks or by grappling arms from above or from one side may be done only if the container is designed for this type of handling.

(b) Other means of hoisting may be used only if the containers and hoisting means are designed for such use.

(c)(i) When using intermodal container spreaders that employ lanyards for activation of load-disengagement, all possible precautions shall be taken to prevent accidental release of the load.

(ii) Intermodal container spreader twistlock systems shall be designed and used so that a suspended load cannot accidentally be released.

(d) Flat bed trucks or container chassis used to move intermodal containers shall be equipped with pins, flanges, or other means to prevent the container from shifting.

(e) Flat bed, low boy trailers (mafis) and other similar equipment used to transport containers shall be marked with their cargo capacities and shall not be overloaded.

(f) Each tractor shall have all brake air lines connected when pulling trailers equipped with air brakes and shall have the brakes tested before commencing operations.

(7)(a) Intermodal containers shall be inspected for defects in structural members or fittings before handling.

(b) Any intermodal container found to be unsafe shall be identified as such, promptly removed from service and repaired before being returned to service.

(8) Containers shall not be hoisted unless all engaged chassis twist locks are released.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60103, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60103, filed 12/30/98, effective

3/30/99. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60103, filed 10/30/92, effective 12/8/92. Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-56-60103, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60103, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60103, filed 12/11/84.]

WAC 296-56-60105 Grain elevator terminals. Reserved.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60105, filed 12/11/84.]

WAC 296-56-60107 Terminal facilities handling menhaden and similar species of fish. (1)(a) Tanks in terminal areas used for receiving or storing bailwater for recirculating into vessel holds in discharging operations shall be opened or ventilated to minimize contamination of water circulated to the vessel. Bailwater tanks shall be thoroughly drained upon completion of each day's operations and shall be left open to the air. Drainage is unnecessary when bailwater has been treated to remove hydrogen sulfide-producing contaminants and the efficiency of such treatment has been established.

(b) Before employees enter a dock tank, it shall first be drained, rinsed and tested for hydrogen sulfide and oxygen deficiency. Employees shall not enter the tank when the hydrogen sulfide level exceeds twenty ppm or oxygen content is less than nineteen and one-half percent, except in emergencies.

(c) Tests shall be conducted by designated personnel with suitable test equipment and respiratory protective equipment complying with the provisions of this chapter and chapter 296-62 WAC.

(2) Pipelines and hoses on the dock or terminal used for receiving and circulating used bailwater shall be completely drained upon completion of each day's operation and left open to the air.

(3) At least four units of respiratory protective equipment consisting of supplied-air respirators or self-contained breathing apparatus complying with the requirements of chapter 296-62 WAC shall be available in a suitably labeled cabinet for immediate use in case of an emergency caused by oxygen deficiency or hydrogen sulfide. Any employee entering a tank in an emergency shall, in addition to respiratory protective equipment, wear a lifeline and safety harness to facilitate rescue. At least two other employees, similarly equipped, shall be continuously stationed outside the tank to observe and to provide rescue services.

(4) The plant superintendent and foremen shall be trained and knowledgeable about the hazards of hydrogen sulfide and oxygen deficiency. They shall be trained in the use of appropriate respiratory and other protective equipment, and in rescue procedures. Other supervisory plant personnel shall be informed of these hazards and instructed in the necessary safety measures, including use of respiratory and rescue equipment.

(5) Supervisory personnel shall be on hand at dockside to supervise discharging of bailwater from vessels.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60107, filed 10/18/00, effective 2/1/01. Statutory Authority:

(2001 Ed.)

Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60107, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60107, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60107, filed 12/11/84.]

PART G—PERSONAL PROTECTION

WAC 296-56-60109 Eye protection. (1)(a) When employees perform work hazardous to the eyes, the employer shall provide eye protection equipment marked or labeled as meeting the manufacturing specifications of American National Standards Practice for Occupational and Educational Eye and Face Protection, ANSI Z87.1-1989, and shall direct that it be used.

(b) For employees wearing corrective spectacles, eye protection equipment required by (a) of this subsection shall be of a type which can be worn over spectacles. Prescription ground safety lenses may be substituted if they provide equivalent protection.

(c) For additional requirements covering eye protection against radiant energy, see WAC 296-56-60235(8).

(2) Eye protection equipment shall be maintained in good condition.

(3) Used eye protection equipment shall be cleaned and disinfected before reissuance to another employee.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60109, filed 10/18/00, effective 2/1/01. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60109, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60109, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60109, filed 12/11/84.]

WAC 296-56-60110 Respiratory protection. The respiratory protection requirements of the general occupational health standards, chapter 296-62 WAC, apply.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60110, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60110, filed 12/11/84.]

WAC 296-56-60111 Head protection. (1) Employees exposed to impact, falling or flying objects, or electric shocks or burns shall wear protective hats.

(2) Protective hats shall bear identifying marks or labels indicating compliance with the manufacturing provisions of American National Standard Safety Requirements for Industrial Head Protection, ANSI Z89.1-1986.

(3) Protective hats previously worn shall be cleaned and disinfected before issuance by the employer to another employee.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60111, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60111, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60111, filed 12/11/84.]

WAC 296-56-60113 Foot protection. (1) The employer shall ensure that each affected employee wears protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects or objects piercing the sole.

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(2) Protective shoes shall bear identifying marks or labels indicating compliance with the manufacturing provisions of American National Standard for Men's Safety Toe Footwear, ANSI Z41.1-1991.

(3) The employer shall, through means such as vendors or local stores, make safety shoes readily available to all employees.

[Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60113, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60113, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60113, filed 12/11/84.]

WAC 296-56-60115 Other protective measures. (1)

Protective clothing.

(a) Employees performing work that requires special protective clothing shall be directed by the employer to wear the necessary special protective clothing.

(b) When necessary, protective clothing previously worn shall be cleaned and disinfected before reissuance.

(2) Personal flotation devices.

(a) The employer shall provide, and shall direct the wearing of personal flotation devices for those employees, such as line handlers, who are engaged in work in which they may be pulled into the water:

(i) When such employees are working in isolation: or

(ii) Where physical limitations of available working space creates a hazard of falling into the water; or

(iii) Where the work area is obstructed by cargo or other obstacles so as to prevent employees from obtaining safe footing for their work.

(b) Employees working on, over or along water, where the danger of drowning exists, shall be provided with and shall wear approved personal flotation devices.

(i) Employees are not considered exposed to the danger of drowning when:

(A) The water depth is known to be less than chest deep on the exposed individual;

(B) Working behind standard height and strength guard-rails;

(C) Working inside operating cabs or stations which eliminate the possibility of accidental falling into the water;

(D) Wearing approved safety belts with lifeline attached so as to preclude the possibility of falling into the water.

(ii) Prior to and after each use, personal flotation devices shall be inspected for defects which would reduce their designed effectiveness. Defective personal flotation devices shall not be used.

(iii) To meet the requirement of (b) of this subsection, a personal flotation device shall be approved by the United States Coast Guard as a Type I PFD, Type II PFD, Type III PFD, or Type V PFD, or equivalent, pursuant to 46 CFR 160 (Coast Guard Lifesaving Equipment Specifications) and 33 CFR 175.23 (Coast Guard Table of Devices Equivalent to Personal Flotation Devices). Ski belt or inflatable type personal flotation devices are specifically prohibited.

(c) Life rings.

(i) Along docks, walkways or other fixed installations on or adjacent to open water more than five feet deep, approved life rings with line attached shall be provided. The life rings shall be spaced at intervals not to exceed two hundred feet

and shall be kept in easily visible and readily accessible locations.

(ii) When employees are assigned work at other casual locations where exposure to drowning exists, at least one approved life ring with line attached shall be provided in the immediate vicinity of the work.

(iii) Work assigned over water where the vertical drop from an accidental fall exceeds fifty feet, is subject to specific procedures approved by the department.

(iv) Lines attached to life rings shall be at least ninety feet (27.43 m) in length, at least one-quarter inch in diameter and have a minimum breaking strength of five hundred pounds.

(v) Life rings must be United States Coast Guard approved thirty inch size (76.2 cm).

(vi) Life rings and attached lines must be maintained to retain at least seventy-five percent of their designed buoyancy and strength.

(3) Emergency facilities. When employees are exposed to hazardous substances which may require emergency bathing, eye washing or other facilities, the employer shall provide such facilities and maintain them in good working order.

(4) Employers shall instruct employees to report every injury, regardless of severity, to the employer.

(5) Stretchers.

(a) There shall be available for each vessel being worked one Stokes basket stretcher, or its equivalent, permanently equipped with bridles for attaching to the hoisting gear.

(b) Stretchers shall be kept close to vessels and shall be positioned to avoid damage to the stretcher.

(c) A blanket or other suitable covering shall be available.

(d) Stretchers shall have at least four sets of effective patient restraints in operable condition.

(e) Lifting bridles shall be of adequate strength, capable of lifting 1,000 pounds (454 kg) with a safety factor of five, and shall be maintained in operable condition. Lifting bridles shall be provided for making vertical patient lifts at container berths. Stretchers for vertical lifts shall have foot plates.

(f) Stretchers shall be maintained in operable condition. Struts and braces shall be inspected for damage. Wire mesh shall be secured and have no burrs. Damaged stretchers shall not be used until repaired.

(g) Stretchers in permanent locations shall be mounted to prevent damage and shall be protected from the elements if located out-of-doors. If concealed from view, closures shall be marked to indicate the location of the life saving equipment.

(6) Telephone or equivalent means of communication shall be readily available.

(7) Employees working on any bridge or structure leading to a detached vessel berthing installation shall wear United States Coast Guard approved personal flotation devices except where protected by railings, nets, or safety belts and lifelines.

(8) Life ladders. On all docks there shall be substantial built-in-place ladders, spaced at intervals not to exceed four hundred feet, to reach the lowest water use. When portable ladders are to be used, ladders may be bolted to the bullrail or dock structure, or ladders can be secured to an embedded eye

bolt in a concrete dock surface. The immediate area where such ladders or fastenings are located shall be painted with a bright color or of a color which contrasts with the surrounding area. There shall be a ladder at each end of the dock.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60115, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60115, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60115, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60115, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60115, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60115, filed 12/11/84.]

WAC 296-56-60117 Maintenance and load limits. (1)

The structural integrity of docks, piers, wharves, terminals and working surfaces shall be maintained.

(2) Maximum safe load limits, in pounds per square foot (kilograms per square meter), of floors elevated above ground level, and pier structures over the water shall be conspicuously posted in all cargo areas.

Exception: Pier structures used primarily for vehicle traffic may be posted in maximum pounds per axle weight.

(3) Maximum safe load limits shall not be exceeded.

(4) All walking and working surfaces in the terminal area shall be maintained in good repair.

(5) All steel plates, boards, etc., used to temporarily cover small holes or weakened surfaces shall be secured in such a manner as to prevent movement.

(6) All large openings or weakened surfaces shall be barricaded on all exposed sides with barricades equipped with blinkers, flashing lights, or reflectors.

(7) Areas around bitts or cleats where workers perform their duties shall be lighted as required in this section and have a nonslip surface around each bitt or cleat.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60117, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60117, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60117, filed 12/11/84.]

WAC 296-56-60119 Protection from falling. Employees doing maintenance work on cranes, spouts or similar types of equipment, eight feet or more above the ground or surface and not in an area that is protected by any standard safeguards such as walkways with standard railings, or ladders with protective cages, shall wear a safety belt and lanyard which can be attached to the structure.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60119, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60119, filed 12/11/84.]

WAC 296-56-60121 Minimum safety requirements for docks and dock facilities. No provision of this section shall be construed to imply that an employer or employees are responsible for repair, construction or otherwise bringing into compliance facilities over which they have no control.

(1) Working prohibited on unsafe docks or dock facilities. Employers shall not allow employees to perform work on docks or dock facilities which the employer should know do not meet the minimum safety requirements of this section.

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(2) Known unsafe conditions by employees. Employees shall not work on docks or dock facilities which they should know do not meet the minimum safety requirements of this section.

(3) Bulletin boards. At each dock, pier, warehouse or designated area at the job site, there shall be installed a safety bulletin board.

(4) Posting of notices. It shall be the responsibility of the employer to post at prominent places in or adjacent to the work area, legible notices stating:

(a) The location of stretchers, blankets, first-aid equipment and telephones. (Where possible, directional arrows should point to locations.)

(b) The phone numbers of doctors, ambulance services and hospitals within the area and the phone numbers of the police department or other law enforcement agency. (Where possible these numbers shall also be posted on or inside the cover of first-aid cabinets and kits.)

(5) Ventilation. All areas where employees are required to work shall be ventilated as required by the "general occupational health standards," chapter 296-62 WAC.

(6) Power outlets. Power outlets installed to supply power to vessels shall be located in such a manner that the workers will not come into contact with supply lines. Unprotected power lines shall not be driven over by equipment. If located on the underside or waterside of the bull rail, a well lighted walkway with hand rails shall be provided to the power outlets.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60121, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60121, filed 12/11/84.]

WAC 296-56-60122 Access to vessels. (1) Access to vessels. The employer shall not permit employees to board or leave any vessel, except a barge or river towboat, until the following requirements have been met:

(a) Whenever practical a gangway of not less than twenty inches wide walking surface of adequate strength, maintained and secured shall be used. If a gangway is not practical a substantial straight ladder, extending at least thirty-six inches above the upper landing surface and adequately secured against shifting or slipping shall be provided. When conditions are such that neither a gangway nor a straight ladder can be used, a Jacob's ladder meeting the requirements of subsection (4) of this section may be used.

(b) Each side of such gangway, and the turn table if used, shall have a railing with a minimum height of thirty-three inches measured perpendicularly from rail to walking surface at the stanchion, and a mid rail. Rails shall be of wood, pipe, chain, wire or rope and shall be kept taut at all times.

(c) Gangways on vessels inspected and certified by the United States Coast Guard are deemed to meet the foregoing requirements, except in cases where the vessel's regular gangway is not being used.

(d) The gangway shall be kept properly trimmed at all times.

(e) When a fixed tread accommodation ladder is used, and the angle is low enough to require employees to walk on the edge of the treads, cleated duckboards shall be laid over and secured to the ladder.

(f) When the lower end of a gangway overhangs the water between the ship and the dock in such a manner that there is danger of employees falling between the ship and the dock, a net or other suitable protection shall be rigged at the foot of the gangway in such a manner as to prevent employees from falling from the end of the gangway into the water or into the surface.

(g) If the foot of the gangway is more than one foot away from the edge of the apron, the space between them shall be bridged by a firm walkway equipped with railings, with a minimum height of thirty-three inches with midrails on both sides.

(h) Supporting bridles shall be kept clear so as to permit unobstructed passage for employees using the gangway.

(i) When the upper end of the means of access rests on or flush with the top of the bulwark, substantial steps properly secured and equipped with at least one substantial handrail approximately thirty-three inches in height shall be provided between the top of the bulwark and the deck.

(j) Obstructions shall not be laid on or across the gangway.

(k) The means of access shall be illuminated for its full length.

(l) Unless construction of the vessel makes it impossible, the means of access shall be so located that drafts of cargo do not pass over it. Loads shall not be passed over the means of access while employees are on it.

(2) Access to vessels in drydock or between vessels. Gangways meeting the requirements of subsection (1)(a), (b), (i), (j) and (k) of this section shall be provided for access from wingwall to vessel or, when two or more vessels other than barges or river towboats are lying abreast, from one vessel to another.

(3) Access to barges and river towboats.

(a) Ramps for access of vehicles to or between barges shall be of adequate strength, provided with side boards, well maintained and properly secured.

(b) Unless employees can step safely to or from the wharf, float, barge, or river towboat, a ramp meeting the requirements of subsection (1)(a) of this section shall be provided. When a walkway is impractical, a substantial straight ladder, extending at least thirty-six inches above the upper landing surface and adequately secured against shifting or slipping, shall be provided. When conditions are such that neither a walkway nor a straight ladder can be used, a Jacob's ladder meeting the requirements of subsection (4) of this section may be used.

(c) The means of access shall meet the requirements of subsection (1)(i), (j), and (k) of this section.

(4) Jacob's ladders.

(a) Jacob's ladders shall be of the double rung or flat tread type. They shall be well maintained and properly secured.

(b) A Jacob's ladder shall either hang without slack from its lashings or be pulled up entirely.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60122, filed 1/17/86.]

WAC 296-56-60123 Guarding of edges. (1) Vehicle protection.

[Title 296 WAC—p. 1326]

(a) Vehicle curbs, bull rails, or other effective barriers at least six inches (15.24 cm) in height and six inches in width, shall be provided at the waterside edges of aprons and bulkheads, except where vehicles are prohibited. Curbs or bull rails installed after January 1, 1985, shall be at least ten inches (22.9 cm) in height.

(b) The provisions of (a) of this subsection also apply at the edge of any fixed level above the common floor area from which vehicles may fall, except at loading docks, platforms and skids where cargo is moved by vehicles.

(2) Employee protection.

(a) Guardrails shall be provided at locations where employees are exposed to falls of more than four feet from floor or wall openings or waterside edges, including bridges or gangway-like structures leading to pilings, vessel mooring or berthing installations.

(b) Guardrails are not required:

(i) At loading platforms and docks;

(ii) At waterside edges used for cargo or mooring line handling;

(iii) On the working sides of work platforms, skids, or similar workplaces which abut the work area; or

(iv) On railroad rolling stock, highway vehicles, intermodal containers, or similar equipment.

(c) Where guardrails are impractical due to machinery requirements or work processes, an alternate means of fall protection, such as nets, shall be used.

(3) Criteria for guardrails. Guardrails shall meet the following criteria:

(a) They shall be capable of withstanding a force of at least two hundred pounds (890 N) applied in any direction at mid-span of the top rail (when used), or at the uppermost point if there is no guard rail.

(b) If not of solid baluster, grillwork, slatted, or similar construction, guardrails shall consist of top rails and midrails. Midrails, when used, shall be positioned at approximately half the height of the top rail.

(c) The top surface of guardrails installed before October 3, 1983, shall be at least thirty-six inches (.091 m) high. Those installed after October 3, 1983, shall be forty-two inches (1.07 m) high, plus or minus two inches (5.1 cm), high.

(d) Any nonrigid railing such as chain or wire rope shall have a maximum sag, at the mid-point between posts, of not more than six inches (15.24 cm).

(e) Top rails shall be free of sharp edges and maintained in good repair.

(f) Rail ends shall not overhang. This does not prohibit scrollwork, boxed ends or similar nonhazardous projections.

(4) Toeboards. Toeboards shall be provided when employees below could be exposed to falling objects such as tools. Toeboards shall be at least three and one-half inches (8.9 cm) in height from top edge to floor level, and be capable of withstanding a force of fifty pounds (222 N) applied in any direction. Drainage clearance not in excess of one-eighth inch under toeboards is permitted.

(5) Stair railings. Stair railings shall be capable of withstanding a force of at least two hundred pounds (890 N) applied in any direction, and shall not be more than thirty-six inches (0.91 m) nor less than thirty-two inches (0.81 m) in

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height from the upper top rail surface to the tread surface in line with the leading edge of the tread. Railings and midrails shall be provided at any stairway having four or more risers, as follows:

(a) For stairways less than forty-four inches (1.12 m) wide, at least one railing; and

(b) For stairways more than forty-four inches (1.12 m) but less than eighty-eight inches (2.24 m) wide, a stair rail or handrail on each side, and if eighty-eight or more inches wide, an additional intermediate handrail.

(6) Condition. Railings shall be maintained free of sharp edges and in good repair.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60123, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040, 99-02-024, § 296-56-60123, filed 12/30/98, effective 3/30/99. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60123, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60123, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60123, filed 12/11/84.]

WAC 296-56-60125 Clearance heights. Clearance heights shall be prominently posted where the height is insufficient for vehicles or equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60125, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60125, filed 12/11/84.]

WAC 296-56-60127 Cargo doors. (1) Mechanically operated cargo doors.

(a) Cargo door counterweights shall be guarded.

(b) Lift trucks and cranes shall not be used to move mechanically operated doors except when necessary during repair to the doors. Ropes or other guarding shall be provided to prevent entry into any area if the door may fall or slide.

(c) Vertically operated doors partially opened for work or ventilation shall be secured to prevent accidental closing.

(2) Tackle operated cargo doors.

(a) Doors shall be connected to their lifting tackle with shackles or other secure means.

(b) Lifting bridles and tackles shall have a safety factor of five, based upon maximum anticipated static loading conditions.

(c) Devices shall be provided to hold overhead doors in the open position and to secure them when closed.

(d) Lifting gear and hardware shall be maintained in safe condition.

(e) Lifting ropes shall be placed out of the work area and off the floor.

(3) Horizontal sliding.

(a) Horizontal sliding door rollers shall be constructed to prevent the door from disengaging from overhead tracks.

(b) Sliding doors shall be secured to prevent them from swinging.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60127, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60127, filed 12/11/84.]

WAC 296-56-60129 Platforms and skids. (1) Platforms and skids extending from piers, transit sheds or lofts and used for landing or hooking drafts shall be provided with (2001 Ed.)

guardrails meeting the requirements of WAC 296-56-60123(3) on all open sides. Alternate means, such as nets or safety belts and lifelines, may be used if guardrails are impractical.

(2) Any employee working below a second-story platform or skid shall be protected from falling objects.

(3) Platforms and skids shall be strong enough to bear the loads handled and shall be maintained in safe condition. Safe working loads, which shall be posted or marked on or adjacent to platforms and skids, shall have a minimum safety factor of five for all parts, based upon maximum anticipated static loading conditions and the ultimate strength of the construction material.

(4) The employer shall provide and maintain platform and skid attachments that will prevent accidental movement of the skid or platform.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60129, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60129, filed 12/11/84.]

WAC 296-56-60131 Elevators and escalators. (1) "Elevator" means a permanent hoisting and lowering mechanism with a car or platform moving vertically in guides and serving two or more floors of a structure. The term excludes such devices as conveyors, tiering or piling machines, material hoists, skip or furnace hoists, wharf ramps, lift bridges, car lifts, and dumpers.

(2) "Escalator" means a power-driven continuous moving stairway principally intended for the use of persons.

(3) No elevator or escalator with a defect which affects safety shall be used.

(4) Elevator safety devices shall not be overridden or made inoperable.

(5) Elevators and escalators shall be thoroughly inspected at intervals not exceeding one year. Additional monthly inspections for satisfactory operation shall be conducted by designated persons. Records of the results of the latest annual elevator inspections shall be posted in elevators. Records of annual escalator inspections shall be posted in the vicinity of the escalator or be available at the terminal.

(6) Elevator landing openings shall be provided with doors, gates, or equivalent protection, which shall be in place when the elevator is not at that landing, to prevent employees from falling into the shaft.

(7) The elevator or escalator maximum load limits shall be posted and shall not be exceeded. Elevator load limits shall be posted conspicuously both inside and outside of the car.

(8) Elevators shall be operated only by designated persons except for automatic or door interlocking elevators which provide full shaft door closing and automatic car leveling.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60131, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60131, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60131, filed 12/11/84.]

WAC 296-56-60133 Manlifts. (1) Inspection. Manlifts shall be inspected monthly by a designated person. Safety switches shall be checked weekly. Manlifts found to be

unsafe shall not be operated until repaired. Inspections shall include at least the following:

- (a) Step fastenings;
- (b) Rails;
- (c) Rail supports and fastenings;
- (d) Roller and slides;
- (e) Belt and belt tension;
- (f) Handholds and fastenings;
- (g) Floor landings;
- (h) Guardrails;
- (i) Lubrication;
- (j) Safety switches;
- (k) Warning signs and lights;
- (l) Illumination;
- (m) Drive pulley;
- (n) Bottom (boot) pulley and clearance;
- (o) Pulley supports;
- (p) Motor;
- (q) Drive mechanism;
- (r) Brake;
- (s) Electrical switches;
- (t) Vibration and misalignment;
- (u) "Skip" on up or down run when mounting the step (indicating worn gears); and
- (v) Emergency exit ladders.

(2) Inspection records. Inspection records shall be kept for at least one year. The record of the most recent inspection shall be posted in the vicinity of the manlift or in the terminal.

(3) Emergency stop. An emergency stop device shall be available within easy reach from any position on the belt.

(4) Instructions. Manlift use instructions shall be conspicuously posted.

(5) Top floor warning sign and light. An illuminated sign and red light that are visible to the user shall be provided under the top floor opening of the manlift to warn the user to get off at that floor.

(6) Bottom floor warning sign. A sign visible to descending passengers shall be provided to warn them to get off at the bottom floor.

(7) Upper limit stop. An automatic stop device shall be provided to stop the manlift when a loaded step passes the top landing, except that manlifts installed after October 3, 1983, shall have two such devices.

(8) Handholds and steps. Each step shall be provided with a corresponding handhold.

(9) Emergency ladder. A fixed emergency ladder accessible from any position on the lift and meeting the requirements of WAC 296-56-60209 shall be provided for the entire run of the manlift.

(10) Landings.

(a) Clear and unobstructed landing spaces shall be provided at each level. Manlifts constructed after October 3, 1983, that have a distance of fifty feet (15.24 m) or more between floor landings shall have an emergency landing every twenty-five feet (7.62 m) or less of manlift travel.

(b) Open sides of emergency landings shall be protected by guardrails.

(c) Floor landing entrances and exits shall be guarded by mazes, self-closing gates, or equivalent protection.

(d) Landings shall be of sufficient size and strength to support two hundred fifty pounds (112 N).

(11) Floor opening guards. The ascending sides of manlift floor openings shall be provided with cones or bevel guards to direct the user through the openings.

(12) Maintenance. Manlifts shall be equipped, maintained, and used in accordance with the manufacturer's specifications, which shall be available at the terminal.

(13) Bottom pulley.

(a) The lower pulley shall be supported by the lowest landing.

(b) Sides of the bottom pulley support shall be guarded to prevent contact with the pulley or the steps.

(14) Top clearance. A clearance of at least eleven feet (3.35 m) shall be provided between the top landing and the ceiling.

(15) Brakes. Manlifts shall be equipped with brakes that are:

(a) Self-engaging;

(b) Electrically released; and

(c) Capable of stopping and holding the manlift when the descending side is loaded with the maximum rated load.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60133, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60133, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60133, filed 12/11/84.]

PART H—MANLIFTS—ELECTRIC

WAC 296-56-60135 Manlifts—Electric.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60135, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60135, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60135, filed 12/11/84.]

WAC 296-56-60139 Hoistway enclosures and landings. Hoistways shall be fully enclosed, or enclosed on all landings to a height of six feet above the landing floor or six feet above highest working level or stair level adjacent to the hoistway. Perforated hoistway enclosures can be used where fire resistance is not required, provided:

(1) Steel wire grill or expanded metal grill shall be at least thirteen U.S. gauge steel wire.

(2) Openings in the enclosure shall reject a one inch steel ball.

(3) All hoistway landings shall be properly and adequately lighted.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60139, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60139, filed 12/11/84.]

WAC 296-56-60141 Scope and application. WAC 296-56-60141 through 296-56-60171 apply to the installation, design, and use of all one man capacity, electric elevators subject to inspection under RCW 49.17.120.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60141, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60141, filed 12/11/84.]

WAC 296-56-60143 Hoistway gates. (1) Hoistway gates may be constructed of wood slat, steel wire grill,

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expanded metal or solid material, providing all openings reject a two inch ball and resist a two hundred fifty pound horizontal thrust.

(a) Steel wire and expanded metal gates shall be of at least thirteen gauge steel.

(b) Wood slats must be not less than two inches wide and one-half inch thick, nominal size.

(c) Solid material shall be not less than one-eighth inch reinforced sheet steel or one-half inch plywood.

(2) Hoistway gates may be horizontal swinging, vertical or horizontal sliding or biparting gates.

(a) Hoistway gates shall extend the full width of the elevator car and from one inch above the landing floor to six feet or more above the floor.

(b) Horizontal swinging gates shall be prevented from swinging into hoistway.

(3) Gates shall be equipped with interlocks or mechanical locks and electric contacts designed so that hoistway gates cannot be opened when the car is away from the landing.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60143, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60143, filed 12/11/84.]

WAC 296-56-60145 Elevator car. (1) Elevator cars shall be fully enclosed to car height or to a height of not less than six feet six inches whichever is greater. Elevator cars may be of perforated or solid material provided the material will withstand a horizontal thrust of seventy-five pounds without deflecting one-quarter inch and all openings will reject a one inch ball.

(a) Car frames shall be of substantial metal or wood construction with a safety factor of four for metal frames and six for wood frames.

(b) Wood frames shall be gusseted and bolted or otherwise secured with large washers and lock washers.

(c) The car platform shall not exceed thirty inches inside dimension on each side (6.25 square foot area).

(2) Every car shall have a substantial protective top. The front half may be hinged. The protective top may be made from number nine U.S. wire gauge screen, eleven gauge expanded metal, fourteen gauge sheet steel, or three-quarter inch or heavier plywood. If made of wire screen or metal, the openings shall reject a one-half inch diameter ball.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60145, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60145, filed 12/11/84.]

WAC 296-56-60147 Elevator doors. Elevator car doors shall be provided on all elevators, except on fully enclosed hoistways equipped with hoistway gates and enclosed from the top of the hoistway opening to the ceiling on the landing side.

(1) Car doors may be of solid or perforated construction and shall be capable of resisting a seventy-five pound thrust without deflecting one-quarter inch.

(2) Car doors may be biparting or otherwise horizontally swung provided the door swings within the elevator car.

(3) A positive locking latch device which resists a two hundred fifty pound thrust shall be provided.

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(4) Interlocks or mechanical locks and electric contacts must be provided on cars operating in open hoistways.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60147, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60147, filed 12/11/84.]

WAC 296-56-60149 Counterweight, enclosures, and fastenings. All counterweights shall be fully enclosed for their full length of travel except in closed hoistways where counterweight guide rails have been provided.

(1) Counterweight enclosures shall provide an inspection opening in the bottom of the enclosure large enough to provide for the inspection of cable fastenings, counterweight and buffer. Counterweights of rectangular shape shall be secured by not less than two one-half inch mild steel bolts with locknuts. Round counterweights shall be fastened with a center bolt not less than three-quarter inch diameter and secured with a locknut.

(2) Bolt eyes shall be welded closed.

(3) Cable fastenings shall be not less than three U-shaped clamps with U's on the dead side of the rope or babbitted tapered elevator sockets.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60149, filed 12/11/84.]

WAC 296-56-60151 Guide rails. A minimum of two car guide rails shall be provided. They shall:

(1) Extend at least six inches beyond the maximum travel of the car with buffers compressed.

(2) Be securely fastened to a vertical supporting member for the full length of elevator travel.

(3) Be not less than one and one-half inch by one and one-half inch vertical grain fir or equivalent, one-quarter inch by two inch by two inch angle iron or equivalent.

(4) Not vary more than three-sixteenths inch thickness on brake surfaces for wood guide rails.

(5) Be secured to resist more than one-half inch total deflection on car safety application and resist a two hundred fifty pound horizontal thrust.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60151, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60151, filed 12/11/84.]

WAC 296-56-60153 Hoisting ropes. Hoisting ropes shall be of good grade elevator traction wire rope and shall:

(1) Be at least two ropes of not less than three-eighths inch diameter providing a safety factor of five.

(2) Be fastened by at least three U-type cable clamps with the U on the dead return end of the rope or by approved elevator sockets of the babbitted type.

(3) Be of such length that the car platform will not be more than six inches above the top landing when the counterweight buffer is fully compressed. The counterweight shall be six inches or more away from the counterbalance sheave when the car buffer is fully compressed.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60153, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60153, filed 12/11/84.]

WAC 296-56-60155 Space under hoistway. There shall be no habitable space below the elevator hoistway and counterweight shaft unless the floor is designed to withstand an impact one hundred twenty-five percent greater than the impact generated by a free fall of either the car or counterweight from the full height of the hoistway.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60155, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60155, filed 12/11/84.]

WAC 296-56-60157 Car safeties. All cars suspended or operated from overhead machinery shall be equipped with an approved car safety capable of stopping and holding the car with rated load.

(1) Car safeties shall operate mechanically and be independent of interruption of any electrical circuit.

(2) Car safeties and governor controlled safeties shall automatically operate and the control circuit shall be broken in the event of cable breakage.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60157, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60157, filed 12/11/84.]

WAC 296-56-60159 Brakes. All elevators shall be equipped with brakes designed to engage mechanically and release electrically.

(1) Brakes shall be located on the final drive of all elevator machines.

(2) The brake actuating circuit shall be so designed that interruption of power by slack cable switch, control switch, and limit switches actuate the brake.

(3) The brakes shall actuate under short circuit, phase failure, or reverse phase conditions.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60159, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60159, filed 12/11/84.]

WAC 296-56-60161 Car controls and safety devices.

(1) Car controls may be automatic pushbutton, constant pressure pushbutton or momentary pushbutton types. Hand rope and car switch controls shall not be used.

(2) Manually operated emergency stop switches shall be installed in all cars not equipped with constant pressure pushbutton controls. The switch shall be clearly marked "emergency stop."

(3) Terminal limiting devices shall operate independently of the car controls and automatically stop the car at the top and bottom terminal landings.

(4) All winding drum machine type elevators shall be equipped with top and bottom final limit switches.

(5) A slack rope device of manual reset design shall be required on all winding drum type machines. The device shall be designed to de-energize the circuit to the drive motor and brake.

(6) All installations shall be equipped with an overspeed governor. This governor shall be set not to exceed one hundred seventy-five feet per minute and shall be designed to de-energize the brake control and motor drive circuits simultaneously with the activation of the car safety mechanism. Car

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speeds for these types of installations shall not exceed a speed of one hundred twenty-five feet per minute.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60161, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60161; filed 12/11/84.]

WAC 296-56-60167 Hoisting machine mechanisms.

(1) Elevator machines shall be driven by approved type units.

(a) On direct drive or approved worm gear driven type, a mechanically actuated, electrically released brake shall be installed on the driving unit.

(b) On V belt driven types, a minimum of four belts, one-half inch minimum size, shall be used to transmit power from the motor to the drive shaft and a mechanically actuated, electrically released brake shall be installed on the final drive shaft.

(2) Wherever practical, elevator machines shall be installed on the top side of their supporting structure.

(3) All components of the driving mechanism and parts subject to stress involved in suspending the load or related equipment shall be designed to withstand eight times the total weight to be suspended, including load, counterweight, car and cables.

(4) Gears shall be made of steel or equivalent material. Cast iron gears are prohibited.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60167, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60167, filed 12/11/84.]

WAC 296-56-60169 Elevator car and counterweight buffers. (1) Elevator cars shall be provided with adequate car buffers.

(2) All elevators using a counterweight shall be provided with adequate counterweight buffers.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60169, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60169, filed 12/11/84.]

WAC 296-56-60171 General requirements. (1) Adequate lighting shall be provided at each landing and in the shaftway.

(2) A sign bearing the following information shall be conspicuously posted within the car:

(a) Maximum capacity one person;

(b) Total load limit in pounds;

(c) For authorized personnel use only.

(3) A fire extinguisher in proper working condition shall be available in the car.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60171, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60171, filed 12/11/84.]

PART I—MANLIFTS—HAND POWER

WAC 296-56-60180 Scope and application. WAC 296-56-60180 through 296-56-60207 apply to the installation, design, and use of all one man capacity, hand power counterweighted elevators subject to inspection under RCW 49.17.120.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60180, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60180, filed 12/11/84.]

WAC 296-56-60183 Hoistway landings. (1) Every hoistway landing shall be protected on all sides other than the landing opening side with a standard guard rail and intermediate guard rail. All landings except the bottom landing shall have a toe board installed on all sides except the landing opening side.

(2) All hoistway entrances shall be not less than six feet six inches in height and in no case shall the width exceed the corresponding car dimensions.

(3) All hoistway entrances must be provided with an approved maze or with a hoistway gate which shall:

(a) Be at least thirty-six inches in height.

(b) Extend downward to within one inch of the landing sill.

(c) Be of the self-closing type, designed to swing horizontally out from the hoistway and closing against a full jam stop.

(d) Be located within four inches of the hoistway edge of the landing sill.

(e) Have a "DANGER" sign conspicuously posted on the landing side of the hoistway gate.

(f) Withstand a two hundred fifty pound horizontal thrust.

(4) All projections extending inwardly from the hoistway enclosure at the entrance side of the car platform shall be bevelled and substantially guarded on the underside by smooth solid material set at an angle of not less than sixty degrees, nor more than seventy-five degrees from the horizontal when cars are not equipped with gates.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60183, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60183, filed 12/11/84.]

WAC 296-56-60185 Hoistway clearances. (1) The minimum clearance between the side of the car and a hoistway enclosure shall be one inch.

(2) The clearance between the car platform and the landing sill shall not be less than one-half inch and not more than one and one-half inches.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60185, filed 12/11/84.]

WAC 296-56-60187 Habitable space under hoistways. There shall be no habitable space below the elevator hoistway or counterweight shaft unless the floor is supported to withstand any impact caused by the car or counterweight dropping freely onto the floor.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60187, filed 12/11/84.]

WAC 296-56-60189 Hoistway guide rails. (1) There shall be a minimum of two opposing guide rails extending to a point six inches beyond the full height of travel of the car when the counterweight buffer is fully compressed.

(2) All rails shall be attached by bolts, lag screws or other approved methods to a vertical supporting member

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which shall not exceed one-half inch deflection with the application of a two hundred fifty pound horizontal thrust at any point.

(3) Wood guide rails shall be at least one and one-half inch by one and one-half inch vertical grain fir or equivalent and shall not vary more than three-sixteenth inch in thickness on the sides which the brakes contact. All joints shall be kept smooth and even.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60189, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60189, filed 12/11/84.]

WAC 296-56-60191 Buffer springs and overtravel of car. Substantial spring buffers shall be installed below the car and also below the counterweight. The hoisting rope shall be of such length that the car platform will not be more than eight inches above the top landing when the counterweight buffer spring is fully compressed.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60191, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60191, filed 12/11/84.]

WAC 296-56-60193 Car specifications. (1) The car shall be built to the following specifications:

(a) The car platform shall be not greater than thirty inches on either side (6.25 square feet area).

(b) The car frame and platform shall be of steel or sound seasoned wood construction and be designed with a safety factor of not less than four for metal and six for wood, based on a maximum capacity of two hundred fifty pounds.

(c) All frame members shall be securely bolted, riveted or welded and braced. If bolted, lock washers or lock nuts shall be used.

(d) Where wooden frame members are bolted, large washers or metal plates shall be used to minimize the possibility of splitting or cracking the wood.

(2) The sides of the car shall be enclosed by a minimum of two safety guard rails with the top rail not less than thirty-six inches nor more than forty-two inches from the car floor. Rails shall sustain a horizontal thrust of two hundred fifty pounds. If solid material is used it shall be smooth surfaced and not less than one-half inch thickness, if wood; not less than sixteen gauge thickness, if steel; and shall be constructed from the car floor to a height of not less than three feet.

(a) Where the hoistway is not enclosed on the entrance side of the car, a self-locking or drop bar gate must be provided. The car gate may be of the folding type, horizontally swung, provided it swings into the car enclosure. Drop bar gates must be of two bar construction, parallelogram type, and conform to requirements specified for car guard rails.

(b) The car gate shall drop into locking slots or be provided with a positive locking type latch capable of withstanding two hundred fifty pounds horizontal thrust.

(3) Every car shall have a substantial protective top. The front half may be hinged. The protective top may be made from number nine U.S. wire gauge screen, eleven gauge expanded metal, fourteen gauge sheet steel, three-quarter inch or heavier plywood. If made of wire screen or metal, the openings shall reject a one-half inch diameter ball.

(4) Every car shall have a proper rack to hold the balance weights.

(5) A sign bearing the following information shall be conspicuously posted within the car:

- (a) Maximum capacity one person;
- (b) Total load limit in pounds;
- (c) For authorized personnel use only.

(6) Every car shall be equipped with a spring loaded foot brake which:

- (a) Operates independently of the car safeties;
- (b) Operates in both directions and will stop and hold the car and its load;
- (c) Locks the car in its position automatically whenever the operator releases the pressure on the foot pedal.

(7) Every car shall be equipped with a car safety device which:

- (a) Applies to the sides of the main guide rails;
- (b) Stops and holds the car and its load immediately when the hoisting rope breaks.

(8) Every car shall have a minimum clearance of six feet six inches from the top of the car platform to the bottom edge of the crosshead or any other obstruction.

(9) A tool box with minimum dimensions of four inches wide by sixteen inches long by three inches in depth shall be provided and firmly attached to the car structure.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60193, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60193, filed 12/11/84.]

WAC 296-56-60195 Counterweights. (1) The assembly of sectional counterweights shall conform to the following requirements:

(a) Rectangular counterweights shall be held together by at least two tie rods one-half inch in diameter fastened with lock washers and double nuts or other approved means.

(b) One three-quarter inch rod may be used to hold the sections of a round counterweight together. Any additional sections or weights shall be secured by an approved means.

(2) The eye bolt for the rope hitch shall be attached to the counterweight in a manner that will prevent the eye bolt from coming loose. The eye of eye bolts shall be welded to prevent it from opening.

(3) Every counterweight runway shall be enclosed with substantial unperforated material for its full distance of travel. Inspection openings shall be provided at either the top or bottom of the counterweight runway. These openings shall be substantially covered at all times except when actually being used for inspection of counterweight fastenings.

(4) Workmen shall load the counterweight for the proper balance of the heaviest person using the elevator and others shall use compensating weights, which shall be available, to maintain a balance.

(5) On elevators with travel of seventy-five feet or more, a compensating chain or cable shall be installed to maintain the proper balance of the counterweight to the car and load in all positions.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60195, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60195, filed 12/11/84.]

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WAC 296-56-60197 Sheaves. The minimum sheave diameter shall be forty times the diameter of the ropes used, i.e., fifteen inch for three-eighths inch rope.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60197, filed 12/11/84.]

WAC 296-56-60199 Hoisting ropes. (1) Hoisting rope shall be of good grade traction elevator wire rope, and shall:

- (a) Be not less than three-eighths inches in diameter.
- (b) Provide a safety factor of five based on the maximum weight supported.

(c) Be of sufficient length to prevent the counterweight from striking the overhead structure when car is at bottom, and prevent the car from striking the overhead before the counterweight is at its lower limit of travel.

(d) Be fastened at each end by at least three or more clamps, with the "U" of the clamp bearing on the dead end of the rope.

(e) Where passed around a metal or other object less than three times the diameter of the cable, have a thimble of the correct size inserted in the eye.

(2) Approved sockets or fittings with the wire properly turned back and babbitted may be used in place of clamps noted in subsection (1)(d) of this section.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60199, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60199, filed 12/11/84.]

WAC 296-56-60201 Operating rope. The operating rope shall be of soft hemp or cotton at least three-quarter inch in diameter. It shall be securely fastened at each end and shall be in proper vertical alignment to prevent bending or cutting where it passes through the openings in the platform or the protective top of the car.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60201, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60201, filed 12/11/84.]

WAC 296-56-60203 Lighting. Adequate lighting shall be provided at each landing and in the shaftway.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60203, filed 12/11/84.]

WAC 296-56-60205 Overhead supports. The overhead supporting members shall be designed, based upon impact loads, with a safety factor of:

- (1) Nine if wood;
- (2) Five if steel.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60205, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60205, filed 12/11/84.]

WAC 296-56-60207 General requirements. (1) No person other than an employee or duly authorized person shall ride or be permitted to ride in the car.

(2) Escape ladders shall be installed extending the full length of the hoistway and shall be located in a position so that, in an emergency, a person can safely transfer from the car platform to the ladder. An "IMPAIRED CLEARANCE" sign

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shall be posted at the bottom of a ladder when the face of the ladder is less than thirty inches from any structure.

(3) An automatic safety dog or device which will prevent the car from leaving the landing until manually released by the operator shall be installed at the bottom landing.

(4) A fire extinguisher in proper working condition shall be available in the car.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 86-03-064 (Order 86-02), § 296-56-60207, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60207, filed 12/11/84.]

PART J—LADDERS, STAIRWAYS OPENINGS, SANITATION, SIGNS, ETC.

WAC 296-56-60209 Fixed ladders. (1) Scope. This section applies to all fixed ladders except:

(a) Ladders forming an integral part of railway cars, highway carriers, cargo containers, or other transportation carrier equipment;

(b) Climbing devices such as step bolts or structural members of tanks and towers;

(c) Ladders built into or vertically attached to tubular scaffold framing; and

(d) Ladders used only for fire fighting or emergency purposes are exempt from the provisions of subsection (5) of this section. All other requirements of this section apply.

(2) Definitions.

(a) "Cage" (basket guard) means a barrier enclosing or nearly enclosing a ladder's climbing space and fastened to one or both of the ladder's side rails or to another structure.

(b) "Fixed ladder" means a ladder, including individual rung ladders, permanently attached to a structure, building, or piece of equipment.

(c) "Ladder safety device" means a support system limiting an employee's drop or fall from the ladder, and which may incorporate friction brakes, lifelines and lanyards, or sliding attachments.

(d) "Well" means a permanent complete enclosure around a fixed ladder, which is attached to the walls of the well.

(3) Defects.

(a) Ladders with broken, split, or missing rungs, steps or rails, broken welds or connections, corrosion or wastage, or other defect which may affect safe use shall be removed from service.

(b) Ladder repairs shall provide strength at least equivalent to that of the original ladder.

(4) Ladder specifications.

(a)(i) Ladders installed before October 3, 1983, shall be capable of withstanding without damage a minimum concentrated load, applied uniformly over a three and one-half inch (8.9 cm) width at the rung center, of two hundred pounds (890 N).

(ii) Ladders installed after October 3, 1983, shall be capable of withstanding two hundred fifty pounds (1112 N) applied as described in (a)(i) of this subsection. If used by more than one employee simultaneously, the ladder as a unit shall be capable of simultaneous additional loading in two hundred fifty pound (1112 N) increments for each additional employee, applied to a corresponding number of rungs. The

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unit shall have a safety factor of four based on ultimate strength, in the designed service.

(b)(i) Ladders installed before October 3, 1983, shall have rungs evenly spaced from nine to sixteen and one-half inches (22.9 to 41.9 cm) apart, center to center.

(ii) Ladders installed after October 3, 1983, shall have rungs evenly spaced twelve inches apart, plus or minus two inches (30.5 cm, plus or minus 5.08 cm), center to center.

(c)(i) Ladders installed before October 3, 1983, shall have a width between side rails of at least ten inches (25.4 cm).

(ii) Ladders installed after October 3, 1983, shall have a width between side rails of at least twelve inches (30.48 cm).

(d) The minimum distance between the rung center line and the nearest permanent object behind the rung shall be four inches (10.16 cm), except that in ladders installed after October 3, 1983, the minimum distance shall be seven inches (17.78 cm) unless physical limitations make a lesser distance, not less than four and one-half inches (11.43 cm), necessary.

(e) When a ladder passes through an opening or past overhead obstructions, a minimum twenty-four inch (.61 m) clearance shall exist between the climbing side and any obstruction. Where this distance is less than thirty inches (0.76 m), a deflection device shall be installed for guidance through the opening.

(f) The side rails of ladders shall extend at least thirty-six inches (0.91 m) above the top landing surface, unless grab bars or equivalent holds are provided.

(g) Ladders whose pitch exceeds ninety degrees to the horizontal (slanting backward on the climbing side) shall not be used.

(5) Protection against falls.

(a) Fixed ladders more than twenty feet (6.1 m) in height shall be provided with a cage, well, or ladder safety device.

(b) When a well or cage is used, ladders with length of climb exceeding thirty feet (9.14 m) shall comply with the following provisions:

(i) The ladder shall consist of multiple sections not exceeding thirty feet (9.14 m) each;

(ii) Each section shall be horizontally offset from adjacent sections, except as specified in (b)(iv) of this subsection; and

(iii) A landing platform capable of supporting a load of one hundred pounds per square foot (4.79 kPa) and fitted with guardrails complying with WAC 296-56-60123(3) shall be provided at least every thirty feet (9.14 m), except as specified in (b)(iv) of this subsection;

(iv) For ladders installed after October 3, 1983, offset sections and landing platforms are not required if hinged platforms capable of supporting one hundred pounds per square foot (4.79 kPa), and which are kept closed except when opened for passage, are within the cage or well at intervals not exceeding thirty feet (9.14 m).

(c) Ladders equipped with ladder safety devices shall have rest platforms:

(i) Capable of supporting a load of one hundred pounds per square foot (4.79 kPa);

(ii) Located at intervals of one hundred fifty feet (45.7 m) or less; and

(iii) Protected by guardrails complying with WAC 296-56-60123(3) on three sides.

(d) Where used, ladder safety devices shall:

(i) Be installed and maintained in accordance with the manufacturer's instructions, which shall be available for inspection upon request;

(ii) Be repaired only with replacement parts having performance capability at least equal to that of the original parts;

(iii) Have a connection length between carrier centerlines and safety belts of 10 ± 2 inches (25.4 ± 5.08 cm); and

(iv) Be installed in a manner that does not reduce the ladder's structural capacity.

(e) Ladder cages or wells shall:

(i) Be of rigid construction that allows unobstructed use but prevents an employee from falling through or dislodging the cage or well by falling against it;

(ii) Have smooth inner surfaces;

(iii) Extend at least thirty-six inches (0.91 m) above landings; and

(iv) Extend to within eight feet (2.44 m) above the ground or base, except that a maximum of twenty feet (6.1 m) is permitted where the cage or well would extend into traffic lanes.

(f) Ladders installed after January 1, 1985, on radio, microwave communications, electrical power and similar towers, poles and structures, including stacks and chimneys, shall meet the requirements of this subsection.

(6) Individual rung ladders. Ladders consisting of individual rungs that are attached to walls, conical manhole sections or river cells shall:

(a) Be capable of supporting a load of three hundred fifty pounds (1557 N) without deformation;

(b) Form a continuous ladder, uniformly spaced vertically from twelve inches to sixteen inches (30.5 to 40.6 cm) apart, with a minimum width of ten inches (25.4 cm), and projecting at least four and one-half inches (11.43 cm) from the wall;

(c) Be so constructed that an employee's foot cannot slide off the ends; and

(d) Be firmly attached and without sharp edges.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60209, filed 10/18/00, effective 2/1/01. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60209, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60209, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60209, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60209, filed 12/11/84.]

WAC 296-56-60211 Portable ladders. (1) Scope and applicability. This section applies to all portable ladders, including job-made ladders for temporary use, unless otherwise specified.

(2) Standards for existing manufactured portable ladders.

(a) Rungs of manufactured portable ladders obtained before October 3, 1983, shall be capable of supporting a two hundred pound (890 N) load without deformation.

(b) Rungs shall be evenly spaced from nine to sixteen and one-half inches (22.9 to 41.9 cm), center to center.

(c) Rungs shall be continuous members between rails. Each rung of a double-rung ladder (two side rails and a center rail) shall extend the full width of the ladder.

(d) Width between side rails at the base of the ladder shall be at least twelve inches (30.48 cm) for ladders ten feet (3.05 m) or less in overall length, and shall increase at least one-fourth inch (0.64 cm) for each additional two feet (0.61 m) of ladder length.

(3) Standards for manufactured portable ladders. Manufactured portable ladders obtained after October 3, 1983, shall bear identification indicating that they meet the appropriate ladder construction requirements of the following standards:

ANSI A14.1-1990 Safety Requirements for Portable Wood Ladders

ANSI A14.2-1990 Safety Requirements for Portable Metal Ladders

ANSI A14.5-1992 Safety Requirements for Portable Reinforced Plastic Ladders

(4) Standards for job-made portable ladders. Job-made ladders shall:

(a) Have a minimum and uniform distance between rungs of twelve inches (30.48 cm), center to center;

(b) Be capable of supporting a two hundred fifty pound (1112 N) load without deformation; and

(c) Have a minimum width between side rails of twelve inches (30.48 cm) for ladders ten feet (3.05 m) in height. Width between rails shall increase at least one-fourth inch (0.64 cm) for each additional two feet (0.61 m) of ladder length.

(5) Maintenance and inspection.

(a) The employer shall maintain portable ladders in safe condition. Ladders with the following defects shall not be used and either shall be tagged as unusable if kept on the premises or shall be removed from the worksite:

(i) Broken, split or missing rungs, cleats, or steps;

(ii) Broken or split side rails;

(iii) Missing or loose bolts, rivets, or fastenings;

(iv) Defective ropes; or

(v) Any other structural defect.

(b) Ladders shall be inspected for defects prior to each day's use, and after any occurrence, such as a fall, which could damage the ladder.

(6) Ladder usage.

(a) Ladders made by fastening rungs or devices across a single rail are prohibited.

(b) Ladders shall not be used:

(i) As guys, braces, or skids; or

(ii) As platforms, runways, or scaffolds.

(c) Metal and wire-reinforced ladders with wooden side rails shall not be used when employees on the ladder might come into contact with energized electrical conductors.

(d) Individual sections from different multisectional ladders or two or more single straight ladders shall not be tied or fastened together to achieve additional length.

(e) Except for combination ladders, self-supporting ladders shall not be used as single straight ladders.

(f) Unless intended for cantilever operation, nonself-supporting ladders shall not be used to climb above the top support point.

(g) Ladders shall extend at least thirty-six inches (0.91 m) above the upper support level if employees are to leave or mount the ladder at that level, except that where such extension is impractical other equivalent means such as grab bars may be used to provide a hand grip.

(h) Ladders shall be securely positioned on a level and firm base.

(i) Ladders shall be fitted with slip-resistant bases and secured at top or bottom to prevent the ladder from slipping.

(j) Ladders shall be placed so that employees climbing are not exposed to injury from projecting objects or doors that open toward the ladder.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60211, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60211, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60211, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60211, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60211, filed 12/11/84.]

WAC 296-56-60213 Jacob's ladders. (1) Jacob's ladders shall be of the double rung or flat tread type. They shall be well maintained and properly secured to the dock.

(2) A Jacob's ladder shall either hang without slack from its lashings or be pulled up entirely.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60213, filed 12/11/84.]

WAC 296-56-60215 Fixed stairways. (1) Definition. "Fixed stairway" means interior or exterior stairs serving machinery, tanks, or equipment, and stairs to or from floors, platforms, or pits. The term does not apply to stairs intended only for fire exit purposes, to articulated stairs (the angle of which changes with the rise and fall of the base support) or to stairs forming an integral part of machinery.

(2) New installations.

(a) Fixed stairs installed after October 3, 1983, shall be positioned within the range of thirty degrees to fifty degrees to the horizontal with uniform riser height and tread width throughout each run and be capable of a minimum loading of one hundred pounds per square foot (445 N) and a minimum concentrated load of three hundred pounds (1334 N) at the center of any treadspan. Riser height shall be from six to seven and one-half inches (15.24 to 19.05 cm), stair width a minimum of twenty-two inches (55.88 cm) between vertical barriers, and tread depth a minimum of 12 ± 2 inches (30.48 ± 5.08 cm), and tread nosing shall be straight leading edges.

(b) Stair landings shall be at least twenty inches (50.8 cm) in depth. Where doors or gates open on a stairway, a landing platform shall be provided. Door swing shall not reduce the effective standing area on the landing to less than eighteen inches (45.72 cm) in depth.

(c) Fixed stairs having four or more risers shall have stair railings or handrails complying with WAC 296-56-60123(3).

(d) The railing height from tread surface at the riser face shall be 33 plus or minus 3 inches (83.82 cm plus or minus 7.62 cm).

(e) Restricted areas. When physical features require stairs steeper than those provided for by (a) of this subsection, stairs at angles of fifty degrees to seventy-five degrees from the horizontal may be used if they:

(i) Are capable of supporting a single concentrated load of two hundred pounds (890 N) at the tread centers;

(ii) Have open treads at least four inches (10.16 cm) in depth and eighteen inches (45.72 cm) in width with a uniformly spaced vertical rise between treads of six to nine and one-half inches (15.24 to 24.13 cm); and

(iii) Have handrails that meet the requirements of WAC 296-56-60123(3) on both sides that are not less than thirty inches (76.2 cm) in height from the tread surface at the riser face.

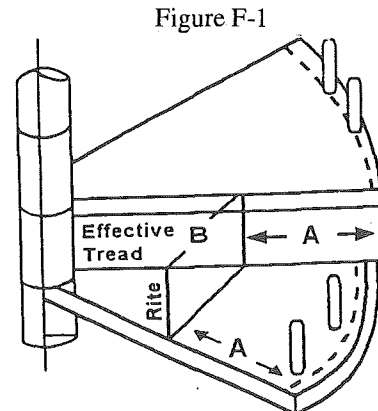
(f) Maintenance. Fixed stairways shall be maintained in safe condition and shall not be obstructed.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60215, filed 10/18/00, effective 2/1/01. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60215, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60215, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60215, filed 12/11/84.]

WAC 296-56-60217 Spiral stairways. (1) Definition. "Spiral stairway" means one with closed circular form, uniform sector-shaped treads and a supporting column.

(2) Requirements. Spiral stairways shall meet the following requirements:

(a) Stairways shall conform to the minimum dimensions of Figure F-1;



Spiral Stairway—Minimum Dimensions

	A (Half-tread width)	B
Normal use by employees	11 inches (27.9 cm)	6 inches (15.2 cm)
Limited access	9 inches (22.9 cm)	5 inches (12.7 cm)

(b) Stairway risers shall be uniform and shall range from six and one-half to ten and one-half inches (16.5 to 26.67 cm) in height;

(c) Minimum loading capability shall be one hundred pounds per square foot (445 N), and minimum tread center concentrated loading shall be three hundred pounds (1334 N);

(d) Railing shall conform to the requirements of WAC 296-56-60123(3). If balusters are used, there shall be a minimum of one per tread. Handrails shall be a minimum of one and one-fourth inches (3.18 cm) in outside diameter; and

(e) Vertical clearance shall be at least six feet, six inches (1.98 m) above the top step.

(3) Maintenance. Spiral stairways shall be maintained in safe condition.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60217, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040. 99-02-024, § 296-56-60217, filed 12/30/98, effective 3/30/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60217, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60217, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60217, filed 12/11/84.]

WAC 296-56-60219 Employee exits. (1) Employee exits shall be clearly marked.

(2) If an employee exit is not visible from employees' work stations, directional signs indicating routes to the exit shall be posted.

(3) Exits shall be readily accessible and sufficient in number to provide employees with a convenient means of escape in emergencies. A clear passage to the exit shall be maintained.

(4) The minimum width of any employee exit shall be twenty-eight inches (71.12 cm).

(5) All fire exits and aiseways of all docks and warehouses shall be clearly marked and kept clear. All main aiseways shall be wide enough to permit passage of a fire truck.

(6) There shall be a twenty-eight inch clearance maintained where employees use a passageway to an exit.

(7) Every building, structure or crane, new or old, shall be provided with an emergency means of egress to permit the prompt escape of occupants in case of fire or other emergency, at all locations with a vertical height of thirty feet or more. Cranes, buildings, or structures erected prior to January 1, 1985, shall comply with the provisions of this standard by July 1, 1986.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60219, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60219, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60219, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60219, filed 12/11/84.]

WAC 296-56-60221 Illumination. Lighting. All areas shall be lighted to meet the requirements of this code.

(1) Active work areas shall be lighted in such a manner that the general area being worked will be illuminated at a minimum intensity of approximately five foot candles measured thirty inches above the dock floor. Supplemental lighting shall be utilized where more than the minimum intensity is necessary for safe operation.

(2) A minimum of three foot candles illumination measured in the manner described above shall be maintained at all points along the bull rail.

(3) The quality of light shall be such that it is reasonably free from glare, and has correct direction, diffusion, and distribution.

(4) Lighting shall not be obstructed by any placement of cargo, structures or other objects which might create a shadow in the work area. Portable lighting shall be provided in those areas that do not meet the minimum requirements of this subsection.

(5) Portable illumination.

(a) All walking and working areas shall be illuminated.

(b) Portable lights shall meet the following requirements:

(i) Portable lights shall be equipped with reflectors and guards to prevent flammable and other material from coming in contact with the bulb, except that guards are not required where the construction of the reflector is such that the bulb is recessed.

(ii) Portable lights shall be equipped with heavy duty electric cords. They may be suspended by such cords only when the means of attachment of the cord to the light is such as to prevent the light from being suspended by the electrical connections.

(iii) All connections and insulation shall be maintained.

(iv) Lighting wires and fixtures for portable lights shall be so arranged as to be free from contact with drafts, running gear, or other moving equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60221, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60221, filed 12/11/84.]

WAC 296-56-60223 Passage between levels and across openings. (1) General. The employer shall provide safe means of passage between different surface levels and across openings.

(2) Dockboards (car and bridge plates).

(a) Dockboards shall be strong enough to support the loads imposed on them.

(b) Portable dockboards shall be anchored in position or be equipped with devices to prevent their movement.

(c) Hand holds or other effective means shall be provided on portable dockboards to permit safe handling.

(d) Positive means shall be used to prevent railcars or highway vehicles from being moved while dockboards or bridge plates are in position.

(3) Ramps.

(a) Ramps shall be strong enough to support the loads imposed on them, provided with sideboards, properly secured and well maintained.

(b) Ramps shall be equipped with guardrails meeting the requirements of WAC 296-56-60123(3) if the slope is more than twenty degrees to the horizontal or if employees could fall more than four feet (1.22 m).

(c) Ramps shall have slip-resistant surfaces.

(d) When necessary to prevent displacement by vehicle wheels, steel plates or similar devices, used to temporarily bridge or cover uneven surfaces or tracks, shall be anchored.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60223, filed 10/18/00, effective 2/1/01. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60223, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60223, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60223, filed 12/11/84.]

WAC 296-56-60225 Guarding temporary hazards. Ditches, pits, excavations, and surfaces in poor repair shall be guarded by readily visible barricades, rails or other equally effective means.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60225, filed 12/11/84.]

WAC 296-56-60227 River banks. (1) This section applies to temporary installations or temporary operations near a river bank.

(2) Where working surfaces at river banks slope so steeply that an employee could slip or fall into the water, the employer shall ensure that the outer perimeter of the working surface is protected by posting or other portable protection such as roping off, and that employees wear a personal flotation device meeting the requirements of WAC 296-56-60115(2).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-56-60227, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60227, filed 12/11/84.]

WAC 296-56-60229 Sanitation. (1) Washing and toilet facilities.

(a) The employer shall provide accessible washing and toilet facilities sufficient for the sanitary requirements of employees. The facilities shall have:

(i) Running water, including hot and cold or tepid water (when cargo handling is conducted at locations without permanent facilities, containers of potable water may be provided in lieu of running water);

(ii) Soap;

(iii) Individual hand towels, clean individual sections of continuous toweling or warm air blowers; and

(iv) Fixed or portable toilets in separate compartments with latch-equipped doors.

(b) Separate toilet facilities shall be provided for male and female employees except when toilet rooms are occupied by only one person at a time. A means of locking shall be provided.

(c) Washing and toilet facilities shall be regularly cleaned and maintained in good order.

(2) Drinking water.

(a) Potable drinking water shall be accessible to employees at all times.

(b) Potable drinking water containers shall be clean, containing only water and ice, and shall be fitted with covers.

(c) Common drinking cups are prohibited.

(3) Prohibited eating areas. Consumption of food or beverages in areas where hazardous materials are being stored or handled shall be prohibited.

(4) Garbage and overboard discharges. Work shall not be conducted in the immediate vicinity of uncovered garbage or in the area of overboard discharges from the vessel's sanitary lines unless employees are protected from the garbage or discharge by a baffle or splash boards.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60229, filed 10/30/92, effective 12/8/92. Statutory Authority: Chapter 49.17 RCW. 91-11-070 (Order 91-01), § 296-56-60229, filed 5/20/91, effective 6/20/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60229, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60229, filed 12/11/84.]

WAC 296-56-60231 Signs and marking. (1) General. Signs required by this chapter shall be clearly worded and legible. They shall contain a key word or legend indicating the reason for the sign.

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(a) Key words are such words as danger, warning, caution.

(b) Legends are more specific explanations such as high voltage, close clearance, pedestrian crossing.

(2) Specific. Every marine terminal shall have conspicuously posted signs as follows:

(a) Locations of first-aid facilities;

(b) Locations of telephones;

(c) Telephone numbers of the closest ambulance service, hospital or other source of medical attention, police, fire department, and emergency squad (if any); and

(d) Locations of fire fighting and emergency equipment and fire exits.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60231, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60231, filed 12/11/84.]

PART K—RELATED TERMINAL OPERATIONS AND EQUIPMENT

WAC 296-56-60233 Related terminal operations and equipment—Machine guarding. (1) Definition. "Guarded" means shielded, fenced, or enclosed by covers, casings, shields, troughs, spillways or railings, or guarded by position or location. Examples of guarding methods are guarding by location (positioning hazards so they are inaccessible to employees) and point of operation guarding (using barrier guards, two-hand tripping devices, electronic safety devices, or other such devices).

(2) General.

(a) Danger zones on machines and equipment used by employees shall be guarded.

(b) Where chips and dust produced by machine operation may result in a hazard to the operator, the machinery shall be equipped with an effective exhaust system at the point of origin, or other equally effective means shall be provided to protect the operator.

(c) Fixed machinery shall be secured to prevent shifting.

(d) A power cut-off device for machinery and equipment shall be provided at the operator's working position.

(e) Machines driven by belts and shafting shall be fitted with a belt-locking or equivalent protective device if the belt can be shifted.

(f) In operations where injury to the operator might result if motors were to restart after power failures, provisions shall be made to prevent machines from automatically restarting upon restoration of power.

(g) The power supply to machines shall be turned off, locked out, and tagged out during repair, adjustment, or servicing.

(h) Machines shall be maintained in a safe working condition.

(i) Only designated employees shall maintain or repair machinery and equipment.

(j) Machines with defects that affect the safety of operation shall not be used.

(3) Hand-fed circular rip saws and hand-fed circular crosscut table saws. Unless fixed or manually adjustable enclosures or guarding provides equivalent protection, hand-

fed circular rip saws and hand-fed circular crosscut table saws shall be guarded as follows:

(a) They shall be equipped with hoods completely enclosing those portions of the saw above the table and the material being cut;

(b) They shall have spreaders to prevent material from squeezing the saw. Spreaders shall be in true alignment with the saw. Spreaders may be removed only during grooving, dadoing, or rabbeting operations, and shall be replaced at the completion of such operations; and

(c) They shall have nonkickback fingers or dogs to oppose the tendency of the saw to pick up material or throw material toward the operator.

(4) Swing cutoff saws.

(a) Swing cutoff saws shall have hoods completely enclosing the upper half of the saw, the arbor end and the point of operation at all saw positions to protect the operator from material thrown up by the saw. The hood shall automatically cover the lower portion of the blade so that when the saw returns to the back of the table the hood rises on top of the fence, and when the saw is moved forward the hood drops on top, remaining in contact with the table or the material.

(b) Swing cutoff saws shall have a device to return the saw automatically to the back of the table without rebound. The device shall not be dependent upon rope, cord or springs.

(c) Devices shall be provided to prevent saws from swinging beyond the front or back edges of the table.

(d) Inverted swing cutoff saws shall have hoods covering the part of the saw protruding above the table top or the material being cut. Hoods shall automatically adjust to the thickness of, and remain in contact with, material being cut.

(5) Radial saws. Unless fixed or manually adjustable enclosures or guards provide equivalent protection, radial saws shall be guarded as follows:

(a) The upper hood of radial saws shall enclose the upper portion of the blade up to and including the end of the saw arbor and shall protect the operator from being struck by debris. The sides of the lower exposed portion of the blade shall be guarded to the blade diameter by a device automatically adjusting to the thickness of the stock and remaining in contact with the stock. The lower guard may be removed only when the saw is used for bevel cuts;

(b) Radial saws used for ripping shall have nonkickback fingers or dogs on both sides to oppose the thrust or tendency of the saw to pick up material or throw material toward the operator;

(c) An adjustable stop shall be provided to prevent travel of radial saw blades beyond the table's edge;

(d) Radial saws shall be installed so that the cutting head returns to the starting position without rebound when released; and

(e) The employer shall direct that employees perform ripping and ploughing against the saw turning direction. Rotation direction and an indication of the end of the saw to be used shall be conspicuously marked on the hood.

(6) Band saws and band resaws.

(a) Saw blades and band saw wheels shall be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table, to protect employees from point-of-operation hazards and flying debris.

(b) Band saws shall be equipped with brakes to stop the band saw wheel if the blade breaks.

(c) Band saws shall be equipped with a tension control device to keep the blade taut.

(7) Abrasive wheels and machinery.

(a) Abrasive wheels shall be used only on machines having enclosure guards to restrain pieces of grinding wheels and to protect employees if the wheel breaks, except as provided in (b) and (c) of this subsection. Where the operator stands in front of the safety guard opening, the safety guard shall be adjustable or have an adjustable tongue or piece at the top of the opening. The safety guard or the tongue shall be adjusted so that it is always within one-fourth inch of the periphery of the wheel. Guards shall be aligned with the wheel and the strength of fastenings shall be greater than the strength of the guard.

(b) When the work provides equivalent protection, or when the machine is designed as a portable saw, guards may be constructed with the spindle end, nut and outer flange exposed. When the work entirely covers the side of the wheel, the side covers of the guard may be removed.

(c) Guarding is not required:

(i) For wheels used for internal work while the wheel is contained within the work being ground; or

(ii) For mounted wheels two inches (5 cm) and smaller in diameter used in portable operations.

(d) Work rests shall be used on fixed grinding machines. Work rests shall be rigidly constructed and adjustable for wheel wear. They shall be adjusted closely to the wheel with a maximum opening of one-eighth inch (3.18 mm) and shall be securely clamped. Adjustment shall not be made while the wheel is in motion.

(e) Grinding wheels shall fit freely on the spindle. The spindle nut shall be tightened only enough to hold the wheel in place.

(f) Grinding machine wheels shall turn at a speed that is compatible with the rated speed of the wheel.

(g) Flanges and blotters shall be used only with wheels designed for their use. Flanges shall be of a type ensuring retention of pieces of the wheel in case of breakage.

(h) Abrasive wheels with operational defects shall not be used.

(8) Rotating parts, drives and connections.

(a) Rotating parts, such as gears and pulleys, that are located seven feet (2.13 m) or less above working surfaces shall be guarded to prevent employee contact with moving parts.

(b) Belt, rope and chain drives shall be guarded to prevent employees from coming into contact with moving parts.

(c) Gears, sprockets and chains shall be guarded to prevent employees coming into contact with moving parts. This requirement does not apply to manually operated sprockets.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60233, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60233, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60233, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60233, filed 12/11/84.]

WAC 296-56-60235 Welding, cutting and heating (hot work) (see also definition of "hazardous cargo, mate-

rial, substance or atmosphere"). (1) Definition. "Hot work" means riveting, welding, flame cutting or other fire or spark-producing operation.

(2) Hot work in confined spaces. Hot work shall not be performed in a confined space until all requirements of chapter 296-62 WAC, Part M, are met.

(3) Fire protection.

(a) To the extent possible, hot work shall be performed in designated locations that are free of fire hazards.

(b) When hot work must be performed in a location that is not free of fire hazards, all necessary precautions shall be taken to confine heat, sparks, and slag so that they cannot contact flammable or combustible material.

(c) Fire extinguishing equipment suitable for the location shall be immediately available and shall be maintained in readiness for use at all times.

(d) When the hot work operation is such that normal fire prevention precautions are not sufficient, additional personnel shall be assigned to guard against fire during hot work and for a sufficient time after completion of the work to ensure that no fire hazard remains. The employer shall instruct all employees involved in hot work operations as to potential fire hazards and the use of fire fighting equipment.

(e) Drums and containers which contain or have contained flammable or combustible liquids shall be kept closed. Empty containers shall be removed from the hot work area.

(f) When openings or cracks in flooring cannot be closed, precautions shall be taken to ensure that no employees or flammable or combustible materials are exposed to sparks dropping through the floor. Similar precautions shall be taken regarding cracks or holes in walls, open doorways and open or broken windows.

(g) Hot work shall not be performed:

(i) In flammable or potentially flammable atmospheres;

(ii) On or in equipment or tanks that have contained flammable gas or liquid or combustible liquid or dust-producing material, until a designated person has tested the atmosphere inside the equipment or tanks and determined that it is not hazardous; or

(iii) Near any area in which exposed readily ignitable materials such as bulk sulphur, baled paper or cotton are stored. Bulk sulphur is excluded from this prohibition if suitable precautions are followed, the person in charge is knowledgeable and the person performing the work has been instructed in preventing and extinguishing sulphur fires.

(h)(i) Drums, containers or hollow structures that have contained flammable or combustible substances shall either be filled with water or cleaned, and shall then be ventilated. A designated person shall test the atmosphere and determine that it is not hazardous before hot work is performed on or in such structures.

(ii) Before heat is applied to a drum, container or hollow structure, an opening to release built-up pressure during heat application shall be provided.

(4) Gas welding and cutting.

(a) Compressed gas cylinders:

(i) Shall have valve protection caps in place except when in use, hooked up or secured for movement. Oil shall not be used to lubricate caps;

(ii) Shall be hoisted only while secured, as on a cradle or pallet, and shall not be hoisted by magnet, choker sling or cylinder caps;

(iii) Shall be moved only by tilting or rolling on their bottom edges;

(iv) Shall be secured when moved by vehicle;

(v) Shall be secured while in use;

(vi) Shall have valves closed when cylinders are empty, being moved or stored;

(vii) Shall be secured upright except when hoisted or carried;

(viii) Shall not be freed when frozen by prying the valves or caps with bars or by hitting the valve with a tool;

(ix) Shall not be thawed by boiling water;

(x) Shall not be exposed to sparks, hot slag, or flame;

(xi) Shall not be permitted to become part of electrical circuits or have electrodes struck against them to strike arcs;

(xii) Shall not be used as rollers or supports;

(xiii) Shall not have contents used for purposes not authorized by the supplier;

(xiv) Shall not be used if damaged or defective;

(xv) Shall not have gases mixed within, except by gas suppliers;

(xvi) Shall be stored so that oxygen cylinders are separated from fuel gas cylinders and combustible materials by either a minimum distance of twenty feet (6.1 m) or a barrier having a fire-resistance rating of thirty minutes; and

(xvii) Shall not have objects that might either damage the safety device or obstruct the valve placed on top of the cylinder when in use.

(b) Use of fuel gas. Fuel gas shall be used only as follows:

(i) Before regulators are connected to cylinder valves, the valves shall be opened slightly (cracked) and closed immediately to clear away dust or dirt. Valves shall not be cracked if gas could reach possible sources of ignition;

(ii) Cylinder valves shall be opened slowly to prevent regulator damage and shall not be opened more than one and one-half turns. Any special wrench required for emergency closing shall be positioned on the valve stem during cylinder use. For manifolded or coupled cylinders, at least one wrench shall be immediately available. Nothing shall be placed on top of a cylinder or associated parts when the cylinder is in use;

(iii) Pressure-reducing regulators shall be attached to cylinder valves when cylinders are supplying torches or devices equipped with shut-off valves;

(iv) Cylinder valves shall be closed and gas released from the regulator or manifold before regulators are removed;

(v) Leaking fuel gas cylinder valves shall be closed and the gland nut tightened. If the leak continues, the cylinder shall be tagged, removed from service, and moved to a location where the leak will not be hazardous. If a regulator attached to a valve stops a leak, the cylinder need not be removed from the workplace but shall be tagged and may not be used again before it is repaired; and

(vi) If a plug or safety device leaks, the cylinder shall be tagged, removed from service, and moved to a location where the leak will not be hazardous.

(c) Hose.

(i) Fuel gas and oxygen hoses shall be easily distinguishable from each other by color or sense of touch. Oxygen and fuel hoses shall not be interchangeable. Hoses having more than one gas passage shall not be used.

(ii) When oxygen and fuel gas hoses are taped together, not more than four of each twelve inches (10.16 cm of each 30.48 cm) shall be taped.

(iii) Hose shall be inspected before use. Hose subjected to flashback or showing evidence of severe wear or damage shall be tested to twice the normal working pressure but not less than two hundred p.s.i. (1378.96 kPa) before re-use. Defective hose shall not be used.

(iv) Hose couplings shall not unlock or disconnect without rotary motion.

(v) Hose connections shall be clamped or securely fastened to withstand twice the normal working pressure but not less than three hundred p.s.i. (2068.44 kPa) without leaking.

(vi) Gas hose storage boxes shall be ventilated.

(d) Torches.

(i) Torch tip openings shall only be cleaned with devices designed for that purpose.

(ii) Torches shall be inspected before each use for leaking shut-off valves, hose couplings and tip connections. Torches shall be inspected before each use for leaking shut-off valves, hose couplings and tip connections. Torches with such defects shall not be used.

(iii) Torches shall not be lighted from matches, cigarette lighters, other flames or hot work.

(e) Pressure regulators. Pressure regulators, including associated gauges, shall be maintained in safe working order.

(f) Operational precaution. Gas welding equipment shall be maintained free of oil and grease.

(5) Arc welding and cutting.

(a) Manual electrode holders.

(i) The employer shall ensure that only manual electrode holders intended for arc welding and cutting and capable of handling the maximum current required for such welding or cutting shall be used.

(ii) Current-carrying parts passing through those portions of the holder gripped by the user and through the outer surfaces of the jaws of the holder shall be insulated against the maximum voltage to ground.

(b) Welding cables and connectors.

(i) Arc welding and cutting cables shall be insulated, flexible and capable of handling the maximum current required by the operation, taking into account the duty cycles.

(ii) Only cable free from repair or splice for ten feet (3 m) from the electrode holder shall be used unless insulated connectors or splices with insulating quality equal to that of the cable are provided.

(iii) When a cable other than the lead mentioned in (b)(ii) of this subsection wears and exposes bare conductors, the portion exposed shall not be used until it is protected by insulation equivalent in performance capacity to the original.

(iv) Insulated connectors of equivalent capacity shall be used for connecting or splicing cable. Cable lugs, where used as connectors, shall provide electrical contact. Exposed metal parts shall be insulated.

(c) Ground returns and machine grounding.

(i) Ground return cables shall have current-carrying capacity equal to or exceeding the total maximum output capacities of the welding or cutting units served.

(ii) Structures or pipelines, other than those containing gases or flammable liquids or conduits containing electrical circuits, may be used in the ground return circuit if their current-carrying capacity equals or exceeds the total maximum output capacities of the welding or cutting units served.

(iii) Structures or pipelines forming a temporary ground return circuit shall have electrical contact at all joints. Arcs, sparks or heat at any point in the circuit shall cause rejection as a ground circuit.

(iv) Structures or pipelines acting continuously as ground return circuits shall have joints bonded and maintained to ensure that no electrolysis or fire hazard exists.

(v) Arc welding and cutting machine frames shall be grounded, either through a third wire in the cable containing the circuit conductor or through a separate wire at the source of the current. Grounding circuits shall have resistance low enough to permit sufficient current to flow to cause the fuse or circuit breaker to interrupt the current.

(vi) Ground connections shall be mechanically and electrically adequate to carry the current.

(d) When electrode holders are left unattended, electrodes shall be removed and holders placed to prevent employee injury.

(e) Hot electrode holders shall not be dipped in water.

(f) The employer shall ensure that when arc welders or cutters leave or stop work or when machines are moved, the power supply switch is kept in the off position.

(g) Arc welding or cutting equipment having a functional defect shall not be used.

(h)(i) Arc welding and cutting operations shall be separated from other operations by shields, screens, or curtains to protect employees in the vicinity from the direct rays and sparks of the arc.

(ii) Employees in areas not protected from the arc by screening shall be protected by appropriate filter lenses in accordance with subsection (8) of this section. When welders are exposed to their own arc or to each other's arc, they shall wear filter lenses complying with the requirements of subsection (8) of this section.

(i) The control apparatus of arc welding machines shall be enclosed, except for operating wheels, levers, and handles.

(j) Input power terminals, top change devices and live metal parts connected to input circuits shall be enclosed and accessible only by means of insulated tools.

(k) When arc welding is performed in wet or high-humidity conditions, employees shall use additional protection, such as rubber pads or boots, against electric shock.

(6) Ventilation and employee protection in welding, cutting and heating.

(a) Mechanical ventilation requirements. The employer shall ensure that general mechanical ventilation or local exhaust systems shall meet the following requirements:

(i) General mechanical ventilation shall maintain vapors, fumes and smoke below a hazardous level;

(ii) Local exhaust ventilation shall consist of movable hoods positioned close to the work and shall be of such

capacity and arrangement as to keep breathing zone concentrations below hazardous levels;

(iii) Exhausts from working spaces shall be discharged into the open air, clear of intake air sources;

(iv) Replacement air shall be clean and respirable; and

(v) Oxygen shall not be used for ventilation, cooling or cleaning clothing or work areas.

(b) Hot work in confined spaces. Except as specified in (c)(ii) and (iii) of this subsection, when hot work is performed in a confined space the employer shall, in addition to the requirements of chapter 296-62 WAC, Part M, ensure that:

(i) General mechanical or local exhaust ventilations shall be provided; or

(ii) Employees in the space shall wear respirators in accordance with chapter 296-62 WAC, Part E.

(c) Welding, cutting or heating of toxic metals.

(i) In confined or enclosed spaces, hot work involving the following metals shall only be performed with general mechanical or local exhaust ventilation that ensures that employees are not exposed to hazardous levels of fumes:

(A) Lead base metals;

(B) Cadmium-bearing filler materials; and

(C) Chromium-bearing metals or metals coated with chromium-bearing materials.

(ii) In confined or enclosed spaces, hot work involving the following metals shall only be performed with local exhaust ventilation meeting the requirements of this subsection or by employees wearing supplied air respirators in accordance with chapter 296-62 WAC, Part E;

(A) Zinc-bearing base or filler metals or metals coated with zinc-bearing materials;

(B) Metals containing lead other than as an impurity, or coated with lead-bearing materials;

(C) Cadmium-bearing or cadmium-coated base metals; and

(D) Metals coated with mercury-bearing materials.

(iii) Employees performing hot work in confined or enclosed spaces involving beryllium-containing base or filler metals shall be protected by local exhaust ventilation and wear supplied air respirators or self-contained breathing apparatus, in accordance with the requirements of chapter 296-62 WAC, Part E.

(iv) The employer shall ensure that employees performing hot work in the open air that involves any of the metals listed in (c)(i) and (ii) of this subsection shall be protected by respirators in accordance with the requirements of chapter 296-62 WAC, Part E and those working on beryllium-containing base or filler metals shall be protected by supplied air respirators, in accordance with the requirements of chapter 296-62 WAC, Part E.

(v) Any employee exposed to the same atmosphere as the welder or burner shall be protected by the same type of respiratory and other protective equipment as that worn by the welder or burner.

(d) Inert-gas metal-arc welding. Employees shall not engage in and shall not be exposed to the inert-gas metal-arc welding process unless the following precautions are taken:

(i) Chlorinated solvents shall not be used within two hundred feet (61 m) of the exposed arc. Surfaces prepared

with chlorinated solvents shall be thoroughly dry before welding is performed on them.

(ii) Employees in areas not protected from the arc by screening shall be protected by appropriate filter lenses in accordance with the requirements of subsection (8) of this section. When welders are exposed to their own arc or to each other's arc, filter lenses complying with the requirements of subsection (8) of this section shall be worn to protect against flashes and radiant energy.

(iii) Employees exposed to radiation shall have their skin covered completely to prevent ultraviolet burns and damage. Helmets and hand shields shall not have leaks, openings or highly reflective surfaces.

(iv) Inert-gas metal-arc welding on stainless steel shall not be performed unless exposed employees are protected either by local exhaust ventilation or by wearing supplied air respirators in accordance with the requirements of chapter 296-62 WAC, Part E.

(7) Welding, cutting and heating on preservative coatings.

(a) Before hot work is commenced on surfaces covered by a preservative coating of unknown flammability, a test shall be made by a designated person to determine the coating's flammability. Preservative coatings shall be considered highly flammable when scrapings burn with extreme rapidity.

(b) Appropriate precaution shall be taken to prevent ignition of highly flammable hardened preservative coatings. Highly flammable coatings shall be stripped from the area to be heated. An uncoiled fire hose with fog nozzle, under pressure, shall be immediately available in the hot work area.

(c) Surfaces covered with preservative coatings shall be stripped for at least four inches (10.16 cm) from the area of heat application or employees shall be protected by supplied air respirators in accordance with the requirements of chapter 296-62 WAC.

(8) Protection against radiant energy.

(a) Employees shall be protected from radiant energy eye hazards by spectacles, cup goggles, helmets, hand shields or face shields with filter lenses complying with the requirements of this subsection.

(b) Filter lenses shall have an appropriate shade number, as indicated in Table G-1, for the work performed. Variations of one or two shade numbers are permissible to suit individual preferences.

(c) If filter lenses are used in goggles worn under the helmet, the shade numbers of both lenses equals the value shown in Table G-1 for the operation.

Table G-1.—Filter Lenses for Protection Against Radiant Energy

Operation	Shade No.
Soldering	2
Torch Brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1-6 inches	4 or 5
Heavy cutting, over 6 inches	5 or 6
Light gas welding, up to 1/8 inch	4 or 5
Medium gas welding, 1/8-1/2 inch	5 or 6
Heavy gas welding, over 1/2 inch	6 or 8

Shielded Metal-Arc Welding 1/16 to
 5/32-inch electrodes 10
 Inert gas Metal-Arc Welding (non-ferrous) 1/16 to
 5/32-inch electrodes 11
 Shielded Metal-Arc Welding:
 3/16 to 1/4-inch electrodes 12
 5/16 and 3/8-inch electrodes 14

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60235, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-56-60235, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-56-60235, filed 1/18/95, effective 3/1/95. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60235, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60235, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60235, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60235, filed 12/11/84.]

WAC 296-56-60237 Spray painting. (1) Scope. This section covers painting operations connected with maintenance of structures, equipment and gear at the marine terminal and of transient equipment serviced at the terminal. It does not apply to overall painting of terminal structures under construction, major repair or rebuilding of terminal structures, or portable spraying apparatus not used regularly in the same location.

(2) Definitions.

(a) "Spraying area" means any area where flammable vapors, mists or combustible residues, dusts or deposits may be present due to paint spraying operations.

(b) "Spray booth" means an enclosure containing a flammable or combustible spraying operation and confining and limiting the escape of paint, vapor and residue by means of a powered exhaust system.

(c) "Approved" means, for the purpose of this section, that the equipment has been approved for the specified use by a nationally recognized testing laboratory.

(3) Spray painting requirements for indoor and outdoor spraying areas and booths.

(a) Shut-off valves, containers or piping with attached hoses or flexible connections shall have shut-off valves closed at the connection when not in use.

(b) Pumps used to transfer paint supplies shall have automatic pressure-relieving devices.

(c) Hoses and couplings shall be inspected before use. Hoses showing deterioration, leakage or weakness in the carcass or at the couplings shall be removed from service.

(d)(i) No open flame or spark-producing equipment shall be within twenty feet (6.1 m) of a spraying area unless it is separated from the spraying area by a fire-retardant partition.

(ii) Hot surfaces shall not be located in spraying areas.

(iii) Whenever combustible residues may accumulate on electrical installations, wiring shall be in rigid conduit or in boxes containing no taps, splices or connections.

(iv) Portable electric lights shall not be used during spraying operations. Lights used during cleaning or repairing operations shall be approved for the location in which they are used.

(e) When flammable or combustible liquids are being transferred between containers, both containers shall be bonded and grounded.

(f)(i) Spraying shall be performed only in designated spray booths or spraying areas.

(ii) Spraying areas shall be kept as free from combustible residue accumulations as practical.

(iii) Residue scrapings, debris, rags, and waste shall be removed from the spraying area as they accumulate.

(g) Spraying with organic peroxides and other dual-component coatings shall only be conducted in sprinkler-equipped spray booths.

(h) Only the quantity of flammable or combustible liquids required for the operation shall be allowed in the spraying area, and in no case shall the amount exceed a one-day supply.

(i) Smoking shall be prohibited and "No Smoking" signs shall be posted in spraying and paint storage areas.

(4) Additional requirements for spraying areas and spray booths.

(a) Distribution or baffle plates shall be of noncombustible material and shall be removable or accessible for cleaning. They shall not be located in exhaust ducts.

(b) Any discarded filter shall be removed from the work area or placed in water.

(c) Filters shall not be used when the material being sprayed is highly susceptible to spontaneous heating and ignition.

(d) Filters shall be noncombustible or of an approved type. The same filter shall not be used when spraying with different coating materials if the combination of materials may spontaneously ignite.

(e) Spraying areas shall be mechanically ventilated for removal of flammable and combustible vapor and mist.

(f) Mechanical ventilation shall be in operation during spraying operations and long enough thereafter to exhaust hazardous vapor concentrations.

(g) Rotating fan elements shall be nonsparking or the casing shall consist of or be lined with nonsparking material.

(h) Piping systems conveying flammable or combustible liquids to the spraying booth or area shall be made of metal and be both electrically bonded and grounded.

(i) Air exhausted from spray operations shall not contaminate makeup air or other ventilation intakes. Exhausted air shall not be recirculated unless it is first cleaned of any hazardous contaminants.

(j) Original closed containers, approved portable tanks, approved safety cans or a piping system shall be used to bring flammable or combustible liquids into spraying areas.

(k) If flammable or combustible liquids are supplied to spray nozzles by positive displacement pumps, the pump discharge line shall have a relief valve discharging either to a pump section or detached location, or the line shall be equipped with a device to stop the prime mover when discharge pressure exceeds the system's safe operating pressure.

(l) Wiring, motors and equipment in a spray booth shall be of approved explosion-proof type for Class I, Group D locations and conform with the requirements of chapter 296-24 WAC Part L for Class I, Division 1, Hazardous Locations. Wiring, motors and equipment within twenty feet (6.1 m) of any interior spraying area and not separated by vapor-tight partitions shall not produce sparks during operation and shall

conform to the requirements of chapter 296-24 WAC Part L for Class I, Division 2, Hazardous Locations.

(m) Outside electrical lights within ten feet (3.05 m) of spraying areas and not separated from the areas by partitions shall be enclosed and protected from damage.

(5) Additional requirements for spray booths.

(a) Spray booths shall be substantially constructed of noncombustible material and have smooth interior surfaces. Spray booth floors shall be covered with noncombustible material. As an aid to cleaning, paper may be used to cover the floor during painting operations if it is removed after the painting is completed.

(b) Spray booths shall be separated from other operations by at least 3 feet (0.91 m) or by fire-retardant partitions or walls.

(c) A space of at least 3 feet (0.91 m) on all sides of the spray booth shall be maintained free of storage or combustible materials.

(d) Metal parts of spray booths, exhaust ducts, pipings, airless high-pressure spray guns and conductive objects being sprayed shall be grounded.

(e) Electric motors driving exhaust fans shall not be located inside booths or ducts.

(f) Belts shall not enter ducts or booths unless the belts are completely enclosed.

(g) Exhaust ducts shall be made of steel, shall have sufficient access doors to permit cleaning, and shall have a minimum clearance of 18 inches (0.46 m) from combustible materials. Any installed dampers shall be fully opened when the ventilating system is operating.

(h) Spray booths shall not be alternately used to spray different types of coating materials if the combination of the materials may spontaneously ignite unless deposits of the first material are removed from the booth and from exhaust ducts before spraying of the second material begins.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60237, filed 10/18/00, effective 2/1/01. Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60237, filed 10/30/92, effective 12/8/92. Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-56-60237, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60237, filed 1/17/86; 85-10-004 (Order 85-09), § 296-56-60237, filed 4/19/85; 85-01-022 (Order 84-24), § 296-56-60237, filed 12/11/84.]

WAC 296-56-60239 Compressed air. Employees shall be protected by appropriate eye protection and personal protective equipment complying with the requirements of WAC 296-56-60109 through 296-56-60115 during cleaning with compressed air. Compressed air used for cleaning shall not exceed a pressure of thirty p.s.i. Compressed air shall not be used to clean employees.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-56-60239, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60239, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60239, filed 12/11/84.]

WAC 296-56-60241 Air receivers. (1) Application. This section applies to compressed air receivers and equipment used for operations such as cleaning, drilling, hoisting and chipping. It does not apply to equipment used to convey

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materials or in transportation applications such as railways, vehicles or cranes.

(2) Gauges and valves.

(a) Air receivers shall be equipped with indicating pressure gauges and spring-loaded safety valves. Safety valves shall prevent receiver pressure from exceeding one hundred ten percent of the maximum allowable working pressure.

(b) No other valves shall be placed between air receivers and their safety valves.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60241, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60241, filed 12/11/84.]

WAC 296-56-60243 Fuel handling and storage. (1) Liquid fuel. See WAC 296-24-475 through 296-24-47517.

(a) Only designated persons shall conduct fueling operations.

(b) In case of spillage, filler caps shall be replaced and spillage disposed of before engines are started.

(c) Engines shall be stopped and operators shall not be on the equipment during refueling operations.

(d) Smoking and open flames shall be prohibited in areas used for fueling, fuel storage or enclosed storage of equipment containing fuel.

(e) Equipment shall be refueled only at designated locations.

(f) Liquid fuels not handled by pump shall be handled and transported only in portable containers designed for that purpose. Portable containers shall be metal, have tight closures with screw or spring covers and shall be equipped with spouts or other means to allow pouring without spilling. Leaking containers shall not be used.

(g) Flammable liquids shall only be dispensed in the open from a tank or from other vehicles equipped for delivering fuel to another vehicle if:

(i) Dispensing hoses do not exceed fifty feet (15.24 m) in length; and

(ii) Any powered dispensing nozzles are of the automatic-closing type.

(h) Liquid fuel dispensing devices shall be provided with an easily accessible and clearly identified shut-off device, such as a switch or circuit breaker, to shut off the power in an emergency.

(i) Liquid fuel dispensing devices, such as pumps, shall be mounted either on a concrete island or be otherwise protected against collision damage.

(2) Liquefied gas fuels.

(a) Fueling locations.

(i) Liquefied gas powered equipment shall be fueled only at designated locations.

(ii) Equipment with permanently mounted fuel containers shall be charged outdoors.

(iii) Equipment shall not be fueled or stored near underground entrances, elevator shafts or other places where gas or fumes might accumulate.

(b) Fuel containers.

(i) When removable fuel containers are used, the escape of fuel when containers are exchanged shall be minimized by:

(A) Automatic quick-closing couplings (closing in both directions when uncoupled) in fuel lines; or

(B) Closing fuel container valves and allowing engines to run until residual fuel is exhausted.

(ii) Pressure-relief valve openings shall be in continuous contact with the vapor space (top) of the cylinder.

(iii) Fuel containers shall be secured to prevent their being jarred loose, slipping or rotating.

(iv) Containers shall be located to prevent damage to the container. If located within a compartment, that compartment shall be vented. Containers near the engine or exhaust system shall be shielded against direct heat radiation.

(v) Container installation shall provide the container with at least the vehicle's road clearance under maximum spring deflection, measured from the bottom of the container or to the lowest fitting on the container or housing, whichever is lower.

(vi) Valves and connections shall be protected from contact damage. Permanent protection shall be provided for fittings on removable containers.

(vii) Defective containers shall be removed from service.

(c) Fueling operations. See WAC 296-24-47517.

(i) Fueling operations for liquefied gas fuels shall also comply with the requirements of subsection (1) of this section.

(ii) Using matches or flames to check for leaks is prohibited.

(iii) Containers shall be examined before recharging and again before reuse for the following:

(A) Dents, scrapes and gouges of pressure vessels;

(B) Damage to valves and liquid level gauges;

(C) Debris in relief valves;

(D) Leakage at valves or connections; and

(E) Deterioration or loss of flexible seals in filling or servicing connections.

(d) Fuel storage. See WAC 296-24-47517(6).

(i) Stored fuel containers shall be located to minimize exposure to excessive temperatures and physical damage.

(ii) Containers shall not be stored near exits, stairways or areas normally used or intended for egress.

(iii) Outlet valves of containers in storage or transport shall be closed. Relief valves shall connect with vapor spaces.

(e) Vehicle storage and servicing.

(i) Liquefied gas fueled vehicles may be stored or serviced inside garages or shops only if there are no fuel system leaks.

(ii) Liquefied gas fueled vehicles under repair shall have container shut-off valves closed unless engine operation is necessary for repairs.

(iii) Liquefied gas fueled vehicles shall not be parked near open flames, sources of ignition or unventilated open pits.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-103, § 296-56-60243, filed 10/18/00, effective 2/1/01. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60243, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60243, filed 12/11/84.]

WAC 296-56-60245 Battery charging and changing.

(1) Only designated persons shall change or charge batteries.

[Title 296 WAC—p. 1344]

(2) Battery charging and changing shall be performed only in areas designated by the employer.

(3) Smoking and other ignition sources are prohibited in charging areas.

(4) Filler caps shall be in place when batteries are being moved.

(5) Parking brakes shall be applied before batteries are charged or changed.

(6) When a jumper battery is connected to a battery in a vehicle, the ground lead shall connect to ground away from the vehicle's battery. Ignition, lights and accessories on the vehicle shall be turned off before connections are made.

(7) Batteries shall be free of corrosion buildup and cap vent holes shall be open.

(8) Adequate ventilation shall be provided during charging.

(9) Facilities for flushing the eyes, body and work area with water shall be provided wherever electrolyte is handled, except when employees are only checking battery electrolyte levels or adding water.

(10) Carboy tilters or siphons shall be used to handle electrolyte in large containers.

(11) Battery handling equipment which could contact battery terminals or cell connectors shall be insulated or otherwise protected.

(12) Metallic objects shall not be placed on uncovered batteries.

(13) When batteries are being charged, the vent caps shall be in place.

(14) Chargers shall be turned off when leads are being connected or disconnected.

(15) Installed batteries shall be secured to avoid physical or electrical contact with compartment walls or components.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60245, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60245, filed 12/11/84.]

WAC 296-56-60247 Prohibited operations. (1) Spray painting and abrasive blasting operations shall not be conducted in the vicinity of cargo handling operations.

(2) Welding and burning operations shall not be conducted in the vicinity of cargo handling operations unless such hot work is part of the cargo operation.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60247, filed 12/11/84.]

WAC 296-56-60249 Petroleum docks. (1) Pipe lines which transport petroleum liquids from or to a wharf shall be equipped with valves on shore, so located as to be readily accessible and not endangered by fire on the wharf.

(2) Drip pans, buckets, or other means shall be provided and shall be used to prevent oil spillage upon wharves during loading, disconnecting and draining hoses. After transfer is completed the contents of drip pans and buckets shall be removed and taken to a place of disposal.

(3) Package goods, freight or ship stores shall not be swing-loaded or unloaded during the bulk handling of oils or other flammable liquids in such a manner that the swing-loads will endanger the hose.

(2001 Ed.)

(4) Water lights for use at petroleum wharves shall be a type which does not create a source of ignition.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-56-60249, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60249, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60249, filed 12/11/84.]

WAC 296-56-60251 Boat marinas. (1) All hoisting equipment including derricks, cranes, or other devices used for boat launching, handling cargo, or supplies shall be inspected once a month. Records of this inspection shall be made available upon request.

(2) Floating docks are not required to have bull rails unless lift trucks or other power driven equipment is used on the dock.

(3) "No smoking" signs shall be posted in areas where fueling or flammable material is present.

(4) Flammable material or petroleum products shall be stored in a fireproof storage room or shed.

(5) Slippery surfaces shall be cleaned and nonslip material shall be used if necessary.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60251, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60251, filed 12/11/84.]

WAC 296-56-60253 Canneries and cold storage docks. (1) Hoisting equipment used to load or unload cargo or supplies of fishing vessels shall be inspected once a month certified in accordance with the requirements of WAC 296-56-60093. The record of inspection shall be made available upon request.

(2) Slippery surfaces shall be cleaned and nonslip material shall be used if necessary.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-60253, filed 1/17/86; 85-01-022 (Order 84-24), § 296-56-60253, filed 12/11/84.]

WAC 296-56-60255 Excerpts from Revised Code of Washington. (1) RCW 49.28.100 Hours of operators of power equipment in waterfront operations. It shall be unlawful for any employer to permit any of his employees to operate on docks, in warehouses and/or in or on other waterfront properties any power driven mechanical equipment for the purpose of loading cargo on, or unloading cargo from, ships, barges, or other watercraft, or of assisting in such loading or unloading operations, for a period in excess of twelve and one-half hours at any one time without giving such person an interval of eight hours' rest: Provided, however, The provisions of this section and RCW 49.28.110 shall not be applicable in cases of emergency, including fire, violent storms, leaking or sinking ships or services required by the armed forces of the United States.

(2) RCW 51.28.010 Notice of accident—Notification of worker's rights. Whenever any accident occurs to any worker it shall be the duty of such worker or someone in his or her behalf to forthwith report such accident to his or her employer, superintendent or foreman or forewoman in charge of the work, and of the employer to at once report such accident and the injury resulting therefrom to the department pursuant to RCW 51.28.025, as now or hereafter amended,

(2001 Ed.)

where the worker has received treatment from a physician, has been hospitalized, disabled from work, or has died as the apparent result of such accident and injury.

Upon receipt of such notice of accident, the department shall immediately forward to the worker or his or her beneficiaries or dependents notification, in nontechnical language, of their rights under this title.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-56-60255, filed 12/11/84.]

WAC 296-56-99002 Form—Appendix A—Standard signals for longshore crane signals.

APPENDIX A
STANDARD SIGNALS FOR LONGSHORE CRANE SIGNALS



HOIST THE LOAD



LOWER THE LOAD



HOIST THE LOAD SLOWLY



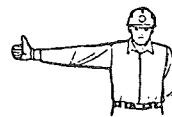
LOWER THE LOAD SLOWLY



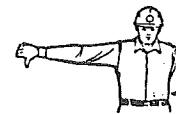
USE MAIN HOOK



USE WHIP HOOK



RAISE THE BOOM



LOWER THE BOOM

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-99002, filed 1/17/86; Order 74-14, Appendix C (codified as WAC 296-56-99002), filed 4/22/74; Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.]

WAC 296-56-99003 Form—Appendix B—Standard signals for longshore crane signals.

APPENDIX B

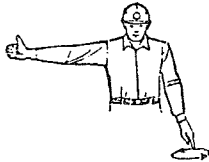
STANDARD SIGNALS FOR LONGSHORE CRANE SIGNALS



STOP



SWING LOAD IN DIRECTION FINGER POINTS



FOR MOBILE CRANES LOWER THE LOAD AND RAISE THE BOOM



FOR MOBILE CRANES HOIST THE LOAD AND LOWER THE BOOM



FOR MOBILE CRANES LOCK THE CRAWLER BELT ON SIDE INDICATED BY RAISED FIST TRAVEL OTHER CRAWLER BELT IN DIRECTION INDICATED BY REVOLVING FIST



FOR MOBILE CRANES TRAVEL BOTH CRAWLER BELTS IN DIRECTION INDICATED BY REVOLVING FISTS

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-03-064 (Order 86-02), § 296-56-99003, filed 1/17/86; Order 74-14, Appendix D (codified as WAC 296-56-99003), filed 4/22/74; Rules (part), filed 9/24/65; Rules (part), filed 3/23/60.]

Chapter 296-59 WAC

SAFETY STANDARDS FOR SKI AREA FACILITIES AND OPERATIONS

WAC

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296-59-107	Avalanche control blasting.
296-59-109	Retrieving misfires or duds.
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296-59-130	Ski lift machinery guarding.
296-59-135	Appendix 1—Nonmandatory alternative lock-out procedure for ski lifts and tows.

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-59-040	First-aid kits and supplies. [Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-040, filed 7/6/88.] Repealed by 00-01-038, filed 12/7/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
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WAC 296-59-001 Foreword. (1) This vertical standard is promulgated in accordance with applicable provisions of the Washington State Administrative Procedure Act, chapter 34.04 RCW, and the Washington Industrial Safety and Health Act, chapter 49.17 RCW.

(2) The requirements of this chapter shall be applied through the department of labor and industries, division of industrial safety and health, in accordance with administrative procedures provided for in chapter 49.17 RCW, and chapters 296-27, 296-350, and 296-360 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-001, filed 7/6/88.]

WAC 296-59-003 Scope and application. (1) The rules of this chapter are applicable to all persons, firms, corporations, or others engaged in the operation of organized ski areas and facilities within the jurisdiction of the department of labor and industries. These rules shall augment the WAC general horizontal standards, specifically referenced WAC vertical standards, and specifically referenced national standards or manuals.

(2) In the event that specific provisions of this chapter may conflict with any other WAC chapter, national standard, or manual, the provisions of this chapter shall prevail.

(3) The rules of this chapter shall not be applied to rescue crews during the time that rescue procedures are in process provided that reasonably prudent methods, equipment, and processes are employed. Personnel directly engaged in rescue operations shall not be subjected to the immediate restraint provisions of RCW 49.17.130.

(4) Nothing herein contained shall prevent the use of existing ski lift and tow equipment during its lifetime unless specific requirements of this chapter require retrofitting or modifications, provided that it shall be in conformance with applicable national or state code requirements at the time of manufacture and be maintained in good condition to conform with safety factors for the materials and method of manufacture used.

(5) Severability. If any provision of this chapter, or its application to any person, firm, corporation, or circumstance

is held invalid under state (RCW) or national (Public Law) laws, the remainder of this chapter, or the application of the provision to other persons or circumstances is not affected.

(6) Variance and procedure. Recognizing that conditions may exist which do not exactly meet the literal requirements of this or other applicable Title 296 WAC standards, pursuant to RCW 49.17.080 and 49.17.090, the director of the department of labor and industries or his/her authorized representative may permit a variance when other means of providing an equivalent measure of protection are afforded. The specific requirements and procedures for variance application are contained in chapters 296-350 and 296-360 WAC. Application forms may be obtained from the assistant director for safety and health or from regional departmental offices.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-003, filed 7/6/88.]

WAC 296-59-005 Incorporation of other standards.

(1) Lifts and tows shall be designed, installed, operated, and maintained in accordance with American National Standard Institute (ANSI) B77.1-1982, Standards for Passenger Tramways—Aerial Tramways and Lifts, Surface Lifts, and Tows—Safety Requirements.

(2) Future revised editions of ANSI B77.1-1982 may be used for new installations or major modifications of existing installations, as recommended or approved by the equipment manufacturer or a qualified design engineer, except that, where specific provisions exist, variances shall be requested from the department.

(3) Commercial explosives shall be transported, stored, and used in compliance with chapter 296-52 WAC, Safety standards for the possession and handling of explosives, and chapter 70.74 RCW, Washington State Explosives Act, except that avalanche control blasting shall comply with the special provisions of this chapter.

(4) The use of military type weapons for avalanche control shall comply with all requirements of the United States government and/or the military branch having jurisdiction. Compliance shall include qualification of employees, security requirements, and storage and handling of ammunition.

(5) The employer shall develop and maintain a hazard communication program as required by chapter 296-62 WAC, Part C, which will provide information to all employees relative to hazardous chemicals or substances to which they are exposed, or may become exposed, in the course of their employment.

(6) When employees perform activities such as construction work or logging, the WAC chapter governing the specific activity shall apply, e.g., chapter 296-155 or 296-54 WAC, et seq.

[Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-59-005, filed 8/3/94, effective 9/12/94; 89-11-035 (Order 89-03), § 296-59-005, filed 5/15/89, effective 6/30/89; 88-14-108 (Order 88-11), § 296-59-005, filed 7/6/88.]

WAC 296-59-007 Definitions. (1) "Act" means the Washington Industrial Safety and Health Act of 1973, RCW 49.17.010 et seq.

(2001 Ed.)

(2) "Aerial work platform" means any form of work platform, work chair, or workbasket designed to lift or carry workmen to an elevated work position.

(3) "ANSI" means the American National Standards Institute.

(4) "Approved" means approved by the director of the department of labor and industries except where this code requires approval by another specific body or jurisdiction authority.

(5) "ASME" means the American Society of Mechanical Engineers.

(6) "Attended," as attending explosives, means the physical presence of an authorized person within the field of vision of explosives. The said attendant shall be awake, alert, and not engaged in activities which may divert their attention so that in case of an emergency the attendant can get to the explosives quickly and without interference, except for brief periods of necessary absence, during which absence simple theft of explosives is not ordinarily possible.

(7) "Authorized person" means a person approved or assigned by the employer to perform specific duties or to be at specific restricted locations.

(8) "Avalanche" means the sliding or falling of a large amount of snow down a steep slope which has a destructive force due to its mass.

(9) "Avalanche control pack" means a specially designed and constructed pack for carrying explosives.

(10) "Avalanche control route" means a route or specific path which is used by authorized persons in order to control the occurrence of avalanches.

(11) "Avalancher" means a device like a cannon which is used for avalanche control blasting. It has a rotating base calibrated for pointing and the barrel is mounted on an elevating mechanism. It uses a compressed gas to propel a projectile containing an explosive charge and detonating means. The gas source is connected to the gun by high pressure hose with in-line control valves and pressure gauges ahead of the trigger mechanism.

(12) "Belay" means to provide an anchor for a safety line when a person is working in a position exposed to falling or sliding, the mountaineering term.

(13) "Blaster's license" means an individual license issued by the department under the provisions of chapter 296-52 WAC.

(14) "Blasting cap" or "cap" when used in connection with the subject of explosives shall mean detonator.

(15) "Buildings that are not inhabited" means a building(s) which has no one in it while explosives are being made up in an adjacent explosives makeup room or while explosives are being held in an adjacent day box or hand charge storage facility.

(16) "Designated" means appointed or authorized by the highest management authority available at the site.

(17) "Department" means the department of labor and industries, division of industrial safety and health, unless the context clearly indicates otherwise.

(18) "Director" means the director of the department of labor and industries or his/her designated representative.

(19) "Dud" or "misfire" means an explosive charge with a detonating means which does not explode when detonation is attempted.

(20) "Fuse igniter" means a special pyrotechnic device intended to be used to ignite safety fuses.

(21) "Handcharge" means an explosive charge with a cap and fuse assembly inserted in place.

(22) "Hazard" means that condition, potential or inherent, which might cause injury, death, or occupational disease.

(23) "Lift certificate to operate" means an operating certificate issued by the Washington state parks and recreation commission pursuant to chapter 70.88 RCW subsequent to annual inspections as required by chapter 352-44 WAC.

(24) "N.E.C." means the National Electric Code, as published by either the National Fire Protection Association or ANSI.

(25) "Occupied building" means a building regularly occupied in whole or in part as a habitation for human beings, or any church, schoolhouse, railroad station, store, or other building where people are accustomed to assemble.

(26) "Qualified" means one who, by possession of a recognized degree, certificate, license, or professional standing, has successfully demonstrated the personal ability to solve or resolve problems relating to the subject matter, the work, or the project.

(27) "RCW" means the Revised Code of Washington, legislative law.

(28) "ROPS" means rollover protective structure.

(29) "S.A.E." means the society of automotive engineers.

(30) "Safety factor" means the ratio of ultimate breaking strength of any member or piece of material or equipment to the actual working stress or safe load when in use.

(31) "Shall" indicates a mandatory requirement.

(32) "Should" indicates a recommended practice.

(33) "WAC" means the Washington Administrative Code.

(34) "WISHA" means Washington industrial safety and health administration.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-007, filed 7/6/88.]

WAC 296-59-010 Safe place standards. The safe place requirements of the general safety and health standards, WAC 296-24-073, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-010, filed 7/6/88.]

WAC 296-59-015 General requirements. (1) The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement of this chapter is prohibited. Such machine, tool, material, or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

(2) The employer shall permit only those employees qualified by training or experience to operate equipment and machinery.

(3) Employees shall use safeguards provided for their protection.

[Title 296 WAC—p. 1348]

(4) Loose or ragged clothing, scarfs, or ties shall not be worn while working around moving machinery.

(5) Workers should not be assigned or permitted to occupy work locations directly under other workers. When such practice is unavoidable, all parties shall be made aware of the potential hazard and adequate protective measures shall be taken. When adequate protective measures are not available, one party shall be moved to eliminate the potential exposure.

(6) Employees shall report to their employers the existence of any unsafe equipment or method, or any other hazard which, to their knowledge, is unsafe. Where such unsafe equipment or method or other hazard exists in violation of this chapter it shall be corrected.

(7) Housekeeping.

(a) All places of employment shall be kept clean to the extent that the nature of the work allows.

(b) The floor of every workroom shall be maintained so far as practicable in a dry condition. Where wet processes are used, drainage shall be maintained. Where necessary or appropriate, waterproof footwear shall be worn.

(c) To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, loose boards, unnecessary holes and openings or other tripping hazards.

(d) Cleaning and sweeping shall be done in such a manner as to minimize the contamination of the air with dust and so far as is practical, shall be done outside of working hours.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-015, filed 7/6/88.]

WAC 296-59-020 Management's responsibility. The "management's responsibility" section of the general safety and health standards, WAC 296-24-020, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-020, filed 7/6/88.]

WAC 296-59-025 Employee's responsibility. The "employee's responsibility" section of the general safety and health standards, WAC 296-24-025, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-025, filed 7/6/88.]

WAC 296-59-027 Work activities which include skiing. Management shall develop a written safety program for all employees whose job duties include skiing. The program shall include but is not limited to the following:

(1) The skiing ability and physical condition of individuals shall be considered when determining individual job assignments;

(2) The ski equipment used shall be appropriate for the individual when performing any given job assignment;

(3) The condition of all ski equipment shall be checked by a qualified individual at the beginning of each ski season;

(4) Employees shall be instructed not to use ski equipment until it has been checked and approved;

(2001 Ed.)

(5) Employees shall be instructed to ski within their ability and in control at all times;

(6) Employees shall be required to check all ski equipment, including adjustments, before starting work each day;

(7) Employees shall be instructed not to use ski equipment which is defective or out of adjustment.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-027, filed 7/6/88.]

WAC 296-59-030 Safety bulletin board. The "safety bulletin board" requirements of the general safety and health standards, WAC 296-25-055, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-030, filed 7/6/88.]

WAC 296-59-035 First-aid. The first-aid provisions of chapter 296-24 WAC, Part A-1 of the general safety and health standards apply within the scope of chapter 296-59 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 00-01-038, § 296-59-035, filed 12/7/99, effective 2/1/00. Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-035, filed 7/6/88.]

WAC 296-59-050 Personal protective equipment, general requirements. (1) Application.

(a) Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is indicated by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact.

(b) Employee-owned equipment. Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

(c) Design, construction, testing, and use of personal protective equipment shall comply with the requirements of the General safety and health standards, chapter 296-24 WAC; the Occupational health standards—Safety standards for carcinogens, chapter 296-62 WAC; or the currently applicable ANSI standard.

(2) Eye and face protection. Eye and face protective equipment shall be provided and worn where there is exposure in the work process or environment to hazard of injury, which can be prevented by such equipment.

(3) Occupational head protection. Employees working in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns, shall be protected by protective helmets, i.e., a lift operator would not be required to use a hardhat while operating the lift. However, if that same person is assisting with maintenance operations and is working under a tower where overhead work is being done, that operator would now be required to wear an approved helmet.

(2001 Ed.)

(a) Helmets for the protection of employees against impact and/or penetration of falling and flying objects shall meet the specifications contained in American National Standards Institute, Z89.1-1986, Safety Requirements for Industrial Head Protection.

(b) Helmets for the head protection of employees exposed to high voltage electrical shock and burns shall meet the specifications contained in American National Standards Institute, Z89.2-1971, Safety Requirements for Industrial Protective Helmets for Electrical Workers, Class B.

(c) Approved head protection shall be worn by operators of snowmobiles and other mobile oversnow equipment which is not equipped with a rigid metal operator's cab.

(4) Occupational foot protection.

(a) Substantial footwear appropriate for the work conditions encountered shall be worn by all employees.

(b) Where the job assignment includes exposure to slipping hazards, soles and heels of footwear shall be of such material and design as to reduce the hazard of slipping.

(5) Safety belts, lifelines, lanyards, and nets.

(a) Safety belts, lifelines, and lanyards which meet the requirements of ANSI A10.14 shall be provided and used whenever employees are working in locations which expose them to a fall of more than ten feet. The particular work location and application shall dictate which type of belt or harness and length of lanyard is used.

(b) Lifelines shall be secured to an anchorage or structural member capable of supporting a minimum dead weight of five thousand four hundred pounds.

(c) Lifelines used on rock scaling applications or in areas where the lifeline may be subjected to cutting or abrasion shall be a minimum of seven-eighths inch wire core manila rope or equivalent. For all other lifeline applications, three-fourths inch manila rope or equivalent with a minimum break strength of five thousand four hundred pounds may be used.

(d) Each safety belt lanyard shall be a minimum of one-half inch nylon, or equivalent, with a minimum of five thousand four hundred pounds breaking strength.

(e) Employees will not be required to wear a safety belt and lanyard while riding on a standard lift chair while seated in the normal riding position.

(f) Safety nets meeting the requirements of ANSI A10.11 shall be used when other acceptable forms of fall protection are not useable. When used, safety nets shall extend a minimum of eight feet beyond the edge offering exposure, shall be hung with sufficient clearance to prevent user's contact with surfaces or objects below, and shall not be more than twenty-five feet below the fall exposure edge.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-050, filed 7/6/88.]

WAC 296-59-055 Lockout requirements. (1) Each employer shall develop a formal written policy and procedure for lockout requirements. The policy shall embody the principles of subsection (2) of this section and shall clearly state that the procedures must be applied in all instances.

(a) The lockout policy shall be posted on all required employee bulletin boards.

(b) The lockout policy and procedures shall be made a part of new employee orientation and employee training programs.

(c) Supervisors and crew leadpersons shall assure compliance with the published policy and procedures in all instances.

(2) Whenever the unexpected start-up of machinery, the energizing of electrical circuits, the flow of material in piping systems, or the removal of guards would endanger workers, such exposure shall be prevented by deactivating and locking out the controls as required by this section.

(3) Equipment requirements.

(a) The employer shall provide and each employee shall use as many padlocks, tags, chains, or devices as are necessary to implement these requirements.

(b) Provisions shall be made whereby the source of power or exposure can be locked out in accordance with the requirements of this section.

(c) On electrically powered equipment, "stop/start" control switches shall not be used as lockout switches. Lockout switches must be the primary circuit disconnects and must adequately separate both the power source and any auxiliary power unit from the prime mover so that accidental start-up of the equipment being locked out is precluded.

(d) Keyed-alike locks, which all open with identical keys, shall not be issued as personal lockout locks.

(4) Training requirements.

(a) Each person who will be given authority to implement these requirements shall first be thoroughly trained in the requirements and procedures.

(b) Before being given authority to deactivate and lockout a particular system or piece of equipment, authorized personnel shall be made fully aware of all power sources and/or material entry sources which may offer exposure.

(c) Checklists shall be used to implement effective lockout procedures for complex systems or equipment.

(i) Complex is identified as those systems or equipment which require the locking out of four or more controls to assure isolation or which have controls remote from the immediate work area.

(ii) Checklists shall identify all controls necessary to achieve isolation at the intended worksite(s).

(iii) Checklists shall provide a space after each listed control to be used for the identity of the person(s) who performed the lockout and required post-lockout tests of each control.

(iv) Checklists shall be prepared by qualified personnel and approved by the responsible area supervisor before each use.

(5) Control procedure.

(a) Each person who could be exposed to the hazard shall apply a personal padlock on each control mechanism. Padlocks shall be applied in such a manner as to physically block the controls from being moved into the operating position. Each lock shall be personally identified or an information tag identifying the owner shall be attached to the lock.

(b) Padlocks used in lockout procedures may only be removed by the person identified on the lock, except, when it is positively determined that the owner/user of the lock has left the premises without removing a lock, the job supervisor

may remove the lock in accordance with a specific procedure formulated by the local plant labor management safety committee or approved by the department.

(6) Testing after lockout or tagout. After tagging or locking out equipment, a test shall be conducted to ascertain that the equipment has been made inoperative or the flow of material has been positively stopped. Precautions shall be taken to ascertain that persons will not be subjected to any hazard while conducting the test if the power source or flow of material is not shut off.

(7) Temporary or alternate power to be avoided. Whenever possible, temporary or alternate sources of power to the equipment being worked on shall be avoided. If the use of such power is necessary, all affected employees shall be informed and the source of temporary or alternate power shall be identified.

(8) Where tags or signs are required to implement the lockout and control procedures, the tag and attachment device shall be constructed of such material that it will not be likely to deteriorate in the environment that it will be subjected to.

(9) Provisional exception. Electrical lighting and instrument circuits of two hundred forty volts or less on single phase systems or two hundred seventy-seven volts on three-phase systems may be exempted from the lockout requirements of subsection (5)(a) of this section provided that:

(a) An information tag meeting the requirements of subsection (8) of this section is used in lieu of a padlock.

(b) The information tag shall be placed on the switch or switch cover handle in such a manner as to easily identify the deactivated switchgear.

(10) Deactivating piping systems.

(a) Hazardous material systems are defined as: Gaseous systems that are operated at more than two hundred psig; systems containing any liquid at more than five hundred psig; systems containing any material at more than 130°F; systems containing material which is chemically hazardous as defined by NFPA 704 M Class 3 and 4; systems containing material classified as flammable or explosive as defined in NFPA Class I.

(b) Lockout of piping systems shall provide isolation to the worksite, including backflow where such potential exists and where the system is classified as a hazardous material system. The required method shall be applied based on the content of the system as specified below:

(i) Nonhazardous systems shall be deactivated by locking out either the pump or a single valve.

(ii) Hazardous material systems shall be deactivated by one of the following methods:

(A) Locking out both the pump and one valve between the pump and the worksite;

(B) Locking out two valves between the hazard source and the worksite;

(C) Installing and locking out a blank flange between the hazard source and worksite.

Exception: Aerial tramways and lifts, surface lifts and tows. It is recognized that some inspection, testing, running adjustments, and maintenance tasks cannot be accomplished on this equipment while using standard lockout procedures, particularly when using a work platform suspended from the haulrope. Management of each ski area shall therefore develop a specific written procedure to be used in any instance where any potentially

exposed personnel cannot personally lock the controls. The procedure for each area shall meet the following minimum requirements:

(I) The controls shall be attended by a qualified operator at all times when personnel are in potentially exposed work positions and the controls are not padlocked out.

(II) Direct communication capability between the control operator and remote work crew shall be maintained at all times.

(III) All personnel involved shall be thoroughly trained in the exact procedures to be followed.

(IV) Extension tools which minimize personnel exposure shall be used where possible.

(V) The equipment shall be operated at the slowest speed possible consistent with the task at hand.

(VI) This exception shall not be used by more than one workcrew at more than one remote location on any single piece of equipment or system.

(VII) This exception is limited to work on the haulrope, towers, and replacing bullwheel liners. For all other work on the bullwheels or drive operations, the master disconnect shall be deactivated and locked out.

Note: See Appendix 1 for illustrative example.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-055, filed 7/6/88.]

WAC 296-59-060 Vessel or confined area requirements. The requirements of WAC 296-62-145 through 296-62-14529, general occupational health standards for permit-required confined spaces, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-59-060, filed 1/18/95, effective 3/1/95; 88-14-108 (Order 88-11), § 296-59-060, filed 7/6/88.]

WAC 296-59-065 Fire protection and ignition sources. The requirements of WAC 296-24-585, et seq., relating to fire protection requirements, shall be applicable within the scope of chapter 296-59 WAC.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-065, filed 7/6/88.]

WAC 296-59-070 Illumination. (1) Sufficient illumination required. All areas shall be sufficiently illuminated in order that persons in the area can safely perform their assigned duties. The recommended levels of illumination specified in chapter 296-62 WAC, general occupational health standards, shall be followed. When areas are not specifically referred to in chapter 296-62 WAC and the adequacy of illumination for the area or task performed is questionable, a determination of the amount of illumination needed may be made by the division of industrial safety and health.

(2) Emergency or secondary lighting system required.

(a) There shall be an emergency or secondary lighting system which can be actuated immediately upon failure of the normal power supply system. The emergency or secondary lighting system shall provide illumination in the following areas:

(2001 Ed.)

(i) Wherever it is necessary for workers to remain at their machine or station to shut down equipment in case of power failure;

(ii) At stairways and passageways or aiseways used by workers as an emergency exit in case of power failure;

(iii) In all plant first-aid and/or medical facilities;

(iv) In emergency power and control room, i.e., in emergency generator rooms unless arranged to start automatically in the event of power failure, or on ski lift motor drive rooms where it would be necessary for employees to switch on the emergency drive system during night skiing.

(b) Emergency lighting facilities shall be checked at least every thirty days for mechanical defects. Defective equipment shall be given priority for repair schedule.

(3) Extension cord type lights. All extension cord type lights shall be provided with proper guards.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-070, filed 7/6/88.]

WAC 296-59-075 Electrical equipment and distribution. (1) National Electrical Code to prevail. All electrical installations and electrical utilization equipment shall comply with the National Electrical Code requirements.

Exception: In instances where (N.E.C.) conflicts with ANSI B77.1 with respect to tramways, surface lifts, or tows, ANSI B77.1 shall prevail.

(2) Authorized personnel to do electrical work. Only those persons who are qualified to do the work assigned and are authorized by the employer shall be allowed to perform electrical work on any electrical equipment or wiring installations.

(3) High voltage areas to be guarded. Motor rooms, switch panel rooms, or other areas where persons may come in contact with high voltages shall be fenced off or be enclosed in a separate area. The gate, door, or access to such area shall be posted with a notice stating that only authorized persons are allowed in the area.

(4) Control panels. In areas where mobile equipment operates, floor stand panels shall be protected from being struck by moving equipment. Start or run handles and buttons shall be protected from accidental actuation.

(5) Switches or control devices. Switches, circuit breakers, or other control devices shall be so located that they are readily accessible for activation or deactivation and shall be marked to indicate their function or machine which they control. The positions of ON and OFF shall be marked or indicated and provision shall be made for locking out the circuit.

(6) Starting requirements for electrically driven equipment after power failure. Electrically driven equipment shall be so designed that it will not automatically start upon restoration of power after a power failure if it will create a hazard to personnel.

(7) Posting equipment automatically activated or remotely controlled. Equipment which is automatically activated or remotely controlled shall be posted, warning persons that machine may start automatically if it will create a hazard to personnel.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-075, filed 7/6/88.]

WAC 296-59-080 Installation, inspection, and maintenance of pipes, piping systems, and hoses. (1) Definitions applicable to this section.

(a) "Hazardous material system" is any system within the following classifications:

(i) "Flammable or explosive" - any system containing materials which are hazardous because they are easily ignited and create a fire or explosion hazard, defined by NFPA as Class I liquids;

(ii) "Chemically active or toxic" - any system containing material which offers corrosion or toxic hazard in itself or can be productive of harmful gases upon release, defined by NFPA 704M as Class 3 and 4 materials;

(iii) "Thermally hazardous" - any system above 130°F which exposes persons to potential thermal burns;

(iv) "Pressurized" - any gaseous system above two hundred psig or liquid system above five hundred psig.

(b) "Piping system" - any fixed piping, either rigid pipe or flexible hose, including all fittings and valves, in either permanent or temporary application.

(2) Design and installation. All new piping systems intended to be used in hazardous material service shall be designed and installed in accordance with applicable provisions of the ASME Code for Pressure Piping or in accordance with applicable provisions of ANSI B31.1 through B31.8. The referenced edition in effect at the time of installation shall be utilized.

Note: Both referenced standard have identical requirements.

(3) Inspection and maintenance.

(a) Management shall develop a formal program of inspections for all hazardous material piping systems. The program shall be based on sound maintenance engineering principles and shall demonstrate due consideration for the manufacturing specifications of the pipe, hose, valves, and fittings, the ambient environment of the installation and the corrosive or abrasive effect of the material handled within the system.

(b) Type and frequency of tests and/or inspections and selection of inspection sites shall be adequate to give indications that minimum safe design operating tolerances are maintained. The tests may include visual and nondestructive methods.

(c) All employers shall submit their formal program of initial and ongoing inspections to the department for approval within one year after the effective date of this requirement.

(d) All existing hazardous material systems shall be inspected to the criteria of this section prior to two years after effective date, or in accordance with a schedule approved by the department.

(4) Inspection records.

(a) Results of inspections and/or tests shall be maintained as a record for each system.

(b) Past records may be discarded provided the current inspection report and the immediate preceding two reports are maintained.

(c) When a system is replaced, a new record shall be established and all past records may be discarded.

(d) The records for each system shall be made available for review by the department upon request.

(e) The employer may omit the inspection requirements for portions of existing systems that are buried or enclosed in permanent structures in such a manner as to prevent exposure to employees even in the event of a failure.

(5) Systems or sections of systems found to be below the minimum design criteria requirements for the current service shall be repaired or replaced with component parts and methods which equal the requirements for new installations.

(6) Identification of piping systems.

(a) Pipes containing hazardous materials shall be identified. It is recommended that USAS A13.1 "Scheme for Identification of Piping Systems" be followed.

(b) Positive identification of piping system content shall be identified by lettered legend giving the name of the content in full or abbreviated form, or a commonly used identification system. Such identification shall be made and maintained at suitable intervals and at valves, fittings, and on both sides of walls or floors. Arrows may be used to indicate the direction of flow. Where it is desirable or necessary to give supplementary information such as hazard of use of the piping system content, this may be done by additional legend or by color applied to the entire piping system or as colored bands. Legends may be placed on colored bands.

Examples of legends which may give both positive identification and supplementary information regarding hazards or use are:

Ammonia	Hazardous liquid or gas
Chlorine	Hazardous liquid or gas
Liquid caustic	Hazardous liquid
Sulphuric acid	Hazardous liquid
Natural gas	Flammable/explosive gas

Note: Manual L-1, published by Chemical Manufacturers Association, Inc., is a valuable guide in respect to supplementary legend.

(c) When color, applied to the entire piping system or as colored bands, is used to give supplementary information it should conform to the following:

CLASSIFICATION	PREDOMINANT COLOR
F-Fire-protection equipment	Red
D-Dangerous materials	Yellow (or orange)
S-Safe materials	Green (or the achromatic colors, white, black, gray, or aluminum)
And, when required, P-Protective materials	Bright blue

(d) Legend boards showing the color and identification scheme in use shall be prominently displayed at each plant. They shall be located so that employees who may be exposed to hazardous material piping systems will have a frequent reminder of the identification program.

(e) All employees who work in the area of hazardous material piping systems shall be given training in the color and identification scheme in use.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-080, filed 7/6/88.]

WAC 296-59-085 Scaffolds, construction, use, and maintenance. (1) Whenever work must be performed at a height which cannot be reached from the floor or permanent platform and where it would not be a safe practice to use a

ladder, a properly constructed scaffold shall be provided and used.

(2) Scaffolds shall be constructed and used in compliance with WAC 296-24-825 through 296-24-84013.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-085, filed 7/6/88.]

WAC 296-59-090 Mobile equipment and lift trucks.

(1) Mobile equipment shall be designed, constructed, maintained, and used in accordance with this section and appropriate ANSI and/or SAE requirements.

(2) Operator training.

(a) Methods shall be devised by management to train personnel in the safe operation of mobile equipment.

(b) Training programs for all mobile equipment shall include the manufacturer's operating instructions when such instructions are available.

(c) Only trained and authorized operators shall be permitted to operate such vehicles.

(3) Special duties of operator. Special duties of the operator of a power-driven vehicle shall include the following:

(a) Test brakes, steering gear, lights, horns, warning devices, clutches, etc., before operating vehicle;

(b) Not move a vehicle while an unauthorized rider is on the vehicle;

(c) Slow down and sound horn upon approaching blind corners or other places where vision or clearance is limited;

(d) Comply with all speed and traffic regulations and other applicable rules;

(e) Have the vehicle being operated under control at all times so that he can safely stop the vehicle in case of emergency; and

(f) Keep the load on the uphill side when driving a fork-lift vehicle on a grade.

(4) Operator to be in proper position. Control levers of lift trucks, front end loaders, or similar types of equipment shall not be operated except when the operator is in his proper operating position.

(5) Raised equipment to be blocked. Employees shall not work below the raised bed of a dump truck, raised buckets of front end loaders, raised blades of tractors or in similar positions without blocking the equipment in a manner that will prevent it from falling. When working under equipment suspended by use of jacks, safety stands or blocking shall be used in conjunction with the jack.

(6) Precautions to be taken while inflating tire. Unmounted split rim wheels shall be placed in a safety cage or other device shall be used which will prevent a split rim from striking the worker if it should dislodge while the tire is being inflated.

(7) Reporting suspected defects. If, in the opinion of the operator, a power-driven vehicle is unsafe, the operator shall report the suspected defect immediately to the person in charge. Any defect which would make the vehicle unsafe to operate under existing conditions shall be cause for immediate removal from service. The vehicle shall not be put back into use until it has been made safe.

(8) Safe speed. Vehicles shall not be driven faster than a safe speed compatible with existing conditions.

(9) Unobstructed view.

(a) Vehicle operators shall have a reasonably unobstructed view of the direction of travel. Where this is not possible, the operator shall be directed by a person or by a safe guidance means or device.

(b) Where practical, mirrors shall be installed at blind corners or intersections which will allow operators to observe oncoming traffic.

(c) It is recommended that vehicles operating in congested areas be provided with an automatic audible or visual alarm system.

(10) Passengers to ride properly.

(a) Passengers shall not be permitted to ride with legs or arms extending outside the running lines of the cab, FOPS, or ROPS of any vehicle.

(b) Passengers on mobile oversnow equipment shall ride within the cab unless exterior seating is provided. The exterior seating may include the cargo bed provided that the bed is equipped with sideboards and a tailgate at least ten inches high. If passengers are permitted to stand in the bed, adequate handholds shall be provided.

(c) The number of passengers and seating arrangements within the cab on any mobile equipment shall not interfere with the operator's ability to safely operate the equipment.

(d) Exterior passengers shall not be permitted on mobile oversnow equipment which has snow grooming equipment mounted on the bed or when the machine is towing any kind of equipment, sleds, etc.

(e) Operators shall use good judgment with respect to speed and terrain when carrying exterior passengers.

(11) Horns and lights.

(a) Every vehicle shall be provided with an operable horn distinguishable above the surrounding noise level.

(b) Any vehicle required to travel away from an illuminated area shall be equipped with a light or lights which adequately illuminate the direction of travel.

(12) Brakes on power-driven vehicles. Vehicles shall be equipped with brakes and devices which will hold a parked vehicle with load on any grade on which it may be used. The brakes and parking devices shall be kept in proper operating condition at all times.

(13) Cleaning vehicles. All vehicles shall be kept free of excessive accumulations of dust and grease which may present a hazard.

(14) Lifting capacity of vehicle to be observed. At no time shall a load in excess of the manufacturer's maximum lifting capacity rating be lifted or carried. Such lifting capacity may only be altered with the approval of the equipment manufacturer or a qualified design engineer.

(15) Posting rated capacity. The maximum rated lifting capacity of all lift trucks shall at all times be posted on the vehicle in such a manner that it is readily visible to the operator.

(16) Carrying loose material. Lift trucks shall not be used to carry loose loads of pipe, steel, iron, lumber, palletized material, rolls of paper, or barrels unless adequate clearance is provided and the loads are stabilized.

(17) Position of lift forks or clamps. The forks or clamps of lift trucks shall be kept as low as possible while the vehicle is moving. They shall be lowered to the ground or floor when the vehicle is parked.

(18) Walking under loads prohibited. No person shall be allowed under the raised load of a lift truck, backhoe, or front end loader.

(19) Hoisting of personnel on vehicle forks prohibited. Personnel shall not be hoisted by standing directly on the forks of vehicles.

(20) Using forklifts as elevated work platforms. A platform or structure built specifically for hoisting persons may be used providing the following requirements are met:

(a) The structure must be securely attached to the forks and shall have standard guardrails and toeboards installed on all sides;

(b) The hydraulic system shall be so designed that the lift mechanism will not drop faster than one hundred thirty-five feet per minute in the event of a failure in any part of the system. Forklifts used for elevating work platforms shall be identified that they are so designed;

(c) A safety strap shall be installed or the control lever shall be locked to prevent the boom from tilting;

(d) An operator shall attend the lift equipment while workers are on the platform;

(e) The operator shall be in the normal operating position while raising or lowering the platform. A qualified operator shall remain in attendance whenever an employee is on the work platform;

(f) The vehicle shall not travel from point to point while workers are on the platform except that inching or maneuvering at very slow speed is permissible; and

(g) The area between workers on the platform and the mast shall be adequately guarded to prevent contact with chains or other shear points.

(21) Overhead guards on lift trucks. All lift trucks shall be equipped with an overhead guard constructed and installed to conform to USAS B56.1-1969 "Safety Code for Powered Industrial Trucks." This guard may be removed only when it cannot be used due to the nature of the work being performed in which case loads shall be maintained so as not to create a hazard to the operator.

(22) Protection from exhaust system. Any exhaust system which might be exposed to contact shall be properly insulated or isolated to protect personnel. Exhaust systems on lift trucks and jitneys shall be constructed to discharge either within twenty inches from the floor or eighty-four inches or more above the floor. The exhausted gases shall be directed away from the operator. The equipment shall be designed in such a manner that the operator will not be exposed to the fumes.

(23) Emergency exit from mobile equipment. Mobile equipment with an enclosed cab shall be provided with an escape hatch or other method of exit in case the regular exit cannot be used.

(24) Vehicle wheels chocked. When driving mobile equipment onto the bed of a vehicle, the wheels of the vehicle shall be chocked.

(25) Prevent trailer from tipping. Suitable methods shall be used or devices installed which will prevent the trailer from tipping while being loaded or unloaded.

(26) Refueling. Gasoline or LPG engines shall be shut off during refueling.

(27) Close valve on LPG container. Whenever vehicles using LP gas as a fuel are parked overnight or stored for extended periods of time indoors, with the fuel container in place, the service valve of the fuel container shall be closed.

(28) LPG tanks. LPG vehicle fuel tanks shall be installed and protected in a manner which will minimize the possibility of damage to the tank.

(29) Inspecting and testing of LPG containers. LPG containers shall be inspected and tested as required by chapter 296-24 WAC.

(30) Spinners on steering wheels. The use of spinners on steering wheels shall be prohibited unless an antikick device is installed or the equipment has a hydraulic steering system.

(31) The hearing conservation requirements of the general occupational health standards, WAC 296-62-09015, shall be applicable for mobile equipment operation.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-090, filed 7/6/88.]

WAC 296-59-095 Requirements for cranes and hoists—General safety and health standards to prevail.

All applicable rules for design, construction, maintenance, operation, and testing of cranes and hoists contained in the General safety and health standards, chapter 296-24 WAC, shall be met.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-095, filed 7/6/88.]

WAC 296-59-100 Avalanche control. (1) General.

(a) During periods of high avalanche danger, slopes and trails in avalanche paths shall not be opened for use until trained personnel have evaluated conditions and determined whether avalanche control work is necessary.

(b) When avalanche control work is deemed necessary, slopes and trails in the potential avalanche path shall not be opened until the work is completed.

(c) An avalanche shall not be purposely released until the avalanche path and potential runout zone are clear of personnel.

(d) Avalanche guards, signs, and/or barricades shall be positioned at normal entrances to the avalanche path if there is any chance that personnel will enter the danger zone during intentional release activities.

(e) During very unstable snow conditions, release of one avalanche may trigger sympathetic releases over a wide area. Avalanche workers shall consider such possibility and clear the appropriate areas of personnel.

(2) Personnel and equipment.

(a) The avalanche control crew shall be adequately trained and physically capable for tasks which can be anticipated in their individual job assignments.

(b) No person shall accept or be given a job assignment which is beyond the individual's physical ability or training.

(c) On-slope assignments which include potential exposure to avalanche hazards shall only be conducted by fully qualified and fully equipped control crew members.

(d) The control crew may be split up into smaller groups (teams) to work on multiple areas simultaneously provided that each team consists of at least two qualified members.

(e) Each avalanche control crew or team shall have one or more designated rescue coordinators as is deemed necessary to maintain communications. Compliance with this requirement may be achieved by designating control crew teams to serve as each others' rescue coordinator provided that the teams are reasonably proximate to each other and do in fact maintain frequent communications.

(f) Each avalanche control crew member shall be equipped for continuous two-way communications to the avalanche crew coordinators.

(g) The avalanche crew or teams shall not be assigned to on-slope areas where they cannot maintain communications with their designated coordinator. This requirement may be met by the use of a relay person, however, if any team completely loses communications they shall return directly to base via the safest route available.

(h) Each person on an avalanche control team shall be equipped with a shovel and an electronic transceiver before commencing on-slope control work. The transceiver shall be in the transmit position whenever personnel are performing on-slope job assignments.

(3) Avalanche rescue plan. Each ski area shall have a written avalanche rescue plan. The plan shall require:

(a) All rescue personnel who will be assigned to on-slope activities shall:

- (i) Be competent skiers;
- (ii) Have a current first-aid card;
- (iii) Be thoroughly trained in the rescue plan details;

(b) A specific list of required equipment for rescue crew personnel including:

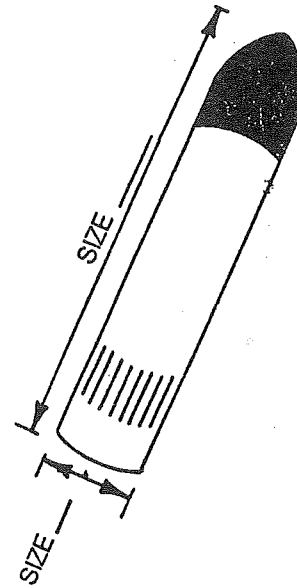
- (i) Probes;
 - (ii) Belaying rope;
 - (iii) Shovels;
 - (iv) Two-way communication radios;
 - (v) Electronic transceivers;
- (c) A list of rescue equipment locations;
- (d) Specific rescue procedures to be followed.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-100, filed 7/6/88.]

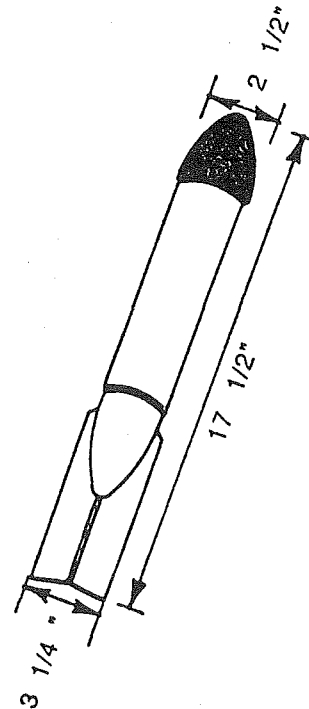
WAC 296-59-102 Acceptable warning signs for typical avalanche control explosive device(s) duds.

DANGER
EXPLOSIVES ON THE MOUNTAIN

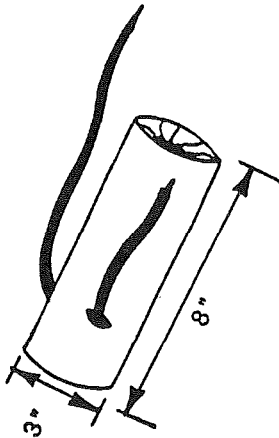
Unexploded warheads, projectiles, or handcharges used in avalanche control may be found in target areas or in avalanche runout zones.



UNEXPLODED WARHEADS
WARHEAD MAY BE DISTORTED
FROM IMPACT.



AVALANCHER PROJECTILE
RED OPAQUE BODY,
RED TRANSLUCENT FINS.



DYNAMITE HANDCHARGE
BROWN COLOR WRAPPING,
WILL USUALLY HAVE FUSE.

If you find an unexploded (dud) charge, do the following:

1. Do not disturb or touch!
2. Mark the location within 5 to 10 feet.
3. Immediately report the location to the nearest lift operator, ski patrolman or U.S. Forest Service employee.

[Statutory Authority: Chapter 49.17 RCW, 88-14-108 (Order 88-11), § 296-59-102, filed 7/6/88.]

WAC 296-59-103 Storage, makeup, and use of explosives for avalanche control blasting. (1) General.

(a) The storage, handling, and use of explosives and blasting agents used in avalanche control practices shall comply with this chapter unless stored, handled, and used in compliance with chapter 70.74 RCW and chapter 296-52 WAC.

(b) The minimum requirements published in WAC 296-59-103 through 296-59-111 (inclusive) shall only be applicable to the storage, handling, and use of explosives and blasting agents in the endeavor of avalanche control. The use of explosives for conventional purposes such as but not limited to demolition, site clearing, or construction shall be regulated by chapter 70.74 RCW and chapter 296-52 WAC.

(2) Management responsibility.

(a) Explosives and blasting agents shall not be stored, kept, or had in any regularly occupied areas or buildings except in compliance with either chapter 296-52 WAC or this chapter.

(b) Explosives and blasting agents shall not be assembled or combined to form armed charges in any regularly occupied area or building except in compliance with this chapter.

(3) Personnel.

(a) Only fully qualified and licensed blasters shall be permitted to assemble or arm explosives components.

(b) Training shall include avalanche blasting experience so that the problems encountered in cold weather blasting are known factors.

(c) All training activities shall be conducted under the attended supervision of a fully qualified and licensed blaster.

(4) General requirements.

(a) Detonating systems for hand-placed or hand-thrown charges.

(i) The ignition system on single-unit handcharges shall consist of a nonelectrical cap, safety fuse, and a fuse igniter.

(ii) Multiple units combined to form a single handcharge may use the above system or an approved detonating cord system. No other ignition system shall be permissible without specific approval by the department.

(b) Multiple charge blasts.

(i) Detonating cord shall be used in lieu of blasting wire to connect multiple charge blasts.

(ii) After all charges are placed, connected to the detonating cord, and the charges are ready to be ignited, a safety fuse and cap shall be attached to the detonating cord. A fuse igniter may then be attached to ignite the safety fuse.

(c) Blasting caps shall be no larger than No. 8 except when recommended by the explosive manufacturer for a particular explosive used within a specific application.

(d) Electric blasting caps are not permitted.

(e) Only the highest quality safety fuse with excellent water resistance and flexibility shall be used.

(f) Fuse length.

(i) Safety fuse length shall be selected to permit the control team adequate escapement time from the blast area under all reasonable contingencies (falls, release of bindings, etc.)

(ii) In no instance shall a fuse length with less than seventy seconds burn time be permitted.

(iii) The burn time of each roll of safety fuse shall be checked prior to use.

(iv) Checked rolls shall be marked with the tested burn time.

(v) It is recommended that all handcharges be prepared for ignition with one safety fuse and igniter.

Note: Standard safety fuse burns at a rate of 0.5 meters ($\pm 10\%$) per seventy seconds at two thousand five hundred meters elevation. This rate equates to approximately nineteen and three-quarter inches fuse length for seventy second hand-charge fuses at normal ski area elevations.

(5) Explosives.

(a) Explosives chosen shall have a safe shelf life of at least one operating season in the storage facilities in which it will be stored.

(b) Explosives chosen shall have excellent water and freezing resistance.

(c) Industrial primers (or boosters) that consist mainly of TNT or gelatin are the recommended explosives.

(6) Transporting explosives and handcharges.

(a) Handcharges or explosives components shall be transported in approved type avalanche control packs, in United States Department of Transportation approved shipping containers or in licensed magazines.

(b) Criteria for avalanche control packs.

(i) The pack shall be constructed of water resistant material.

(ii) Packs shall be constructed with sufficient individual compartments to separate handcharges or explosives compo-

nents from tools or other equipment or supplies which may be carried in the pack.

(iii) Each compartment used for handcharges or explosives components shall have an independent closure means.

(iv) If fuse igniters will be permitted to be carried on the avalanche control pack, a separate compartment with individual closure means shall be attached to the outside of the exterior of the pack.

(c) Use of avalanche control packs.

(i) Packs shall be inspected daily, prior to loading, for holes or faulty compartment closures. Defective packs shall not be used until adequately repaired.

(ii) Tools or other materials shall not be placed in any compartment which contains handcharges or explosives components.

(iii) Fuse igniters shall never be placed anywhere inside the pack when the pack contains handcharges or other explosives components.

(iv) Fuse igniters may be carried in a separate compartment attached to the outside of the pack exterior but preferably in a compartment attached to the front of the carrying harness. Another acceptable alternative is to carry the igniters in a jacket pocket completely separate from the pack.

(v) Handcharges or explosives components shall not be stored or left unattended in avalanche control packs. Unused handcharges shall be promptly disassembled at the end of individual control routes and all components returned to approved storage.

(vi) Individual control team members shall not carry more than thirty-five pounds of handcharges in avalanche control packs.

(vii) A handcharge or cap and fuse assembly which has a fuse igniter attached shall never be placed in an avalanche control pack for any reason.

(d) Whenever explosives or explosives components are transported in or on any vehicle powered by an internal combustion engine, provisions shall be made to ensure that said explosives or containers cannot come into contact with the hot exhaust system.

(e) Handcharges or explosives components shall not be transported in spark-producing metal containers.

(f) Handcharges shall not be transported on public roads and highways when such roads or highways are open to the public. Explosives components shall only be transported on public roads or highways in compliance with United States Department of Transportation regulations.

[Statutory Authority: Chapter 49.17 RCW, 88-14-108 (Order 88-11), § 296-59-103, filed 7/6/88.]

WAC 296-59-105 Handcharge makeup methods.

General. The department shall recognize two permissible methods concerning handcharges for avalanche control blasting. The descriptions and requirements for each method are contained in this section. Every ski area operation which conducts avalanche control blasting should use Method II "Hand charge makeup room." A well designed and constructed handcharge makeup room can enhance the correct assembly of components which will maintain the best possible control over explosives and components, reduce the probability of an

explosives incident, and reduce the incidence of misfires from incorrect makeup or moisture.

(1) Method I. Makeup at the blast site.

(a) The ignition system shall consist of a nonelectrical blasting cap and highest quality water resistant safety fuse, or detonating cord, assembled as recommended by the manufacturer.

(b) Detonating cord (i.e., primacord) shall be used to connect separated multiple-charge blasts.

(c) No other ignition system shall be permissible on hand-placed or hand-thrown avalanche control charges unless variance is granted by the department.

(d) Caps shall be installed on correct length fuses prior to being transported out onto control routes.

(e) Caps shall only be crimped with a crimper tool approved for that purpose.

(f) Assembling caps and fuses shall be done in a warm, dry, well-lighted environment. The location used for assembly shall not have flammable fuels, flammable gases, or explosives present where accidental detonation of the caps could create a secondary ignition or detonation hazard.

(g) Each cap shall be protected by a styrofoam shield or the equivalent before being placed in an avalanche control pack for transportation.

(h) A fuse igniter shall never be attached to a fuse until the fuse and cap assembly is installed in the handcharge at the blast site and the control crew is fully prepared to ignite the charge.

(i) All class A explosives shall be attended as defined in WAC 296-59-007 at all times when the explosive is out of the class 1 storage magazine.

(j) Disbursement of explosive charges from the class 1 storage magazine into avalanche control packs shall be done outside the storage magazine. Records shall be maintained for all explosives disbursed.

(k) Caps, cap and fuse assemblies, armed handcharges, or fuse igniters shall not be carried into or stored in a class 1 magazine which contains class A explosives.

(2) Method II. Handcharge makeup room. This method is different from method I primarily in that the fuse and cap assembly is installed in the explosive charge while inside a special makeup room. The assembly procedure shall be as follows:

(a) Install caps on correct length fuses with an approved crimper tool before explosives are brought into the makeup room.

(b) The cap and fuse assemblies shall not be combined with explosives to form handcharges until just before the intended time of distribution.

(c) Only nonsparking skewers shall be used to punch holes in an explosives cartridge.

(d) The fuse shall be laced or taped in position after inserting the cap in the charge.

(e) Each handcharge shall be placed in an explosives box or avalanche control pack immediately after assembly is completed.

(f) No spark-producing metal tools shall be used to open explosives containers.

(g) Fuse igniters shall never be attached to a fuse or a handcharge until the handcharge is at the blast site and the control crew is fully prepared to ignite the charge.

(3) Makeup room requirements, procedures.

(a) Construction requirements.

(i) Makeup rooms located in accordance with the American Standard Quantity and Distance Tables for storage shall not require construction of reinforced concrete walls, floors, and doors. All other requirements of this chapter shall be applicable for such facilities.

(ii) Floors and walls. The floor and walls shall be constructed of reinforced concrete not less than eight inches thick. The rebar shall be not less than one-half inch diameter and shall be spaced on twelve-inch vertical and horizontal centers. The rebar shall be bent at a ninety degree angle and extend a minimum of twenty-four inches into the adjoining floor or wall to secure each floor and wall joint.

(iii) Roof. The roof is not limited to specific materials but shall provide both weather protection and standard snow loading protection for the region.

(iv) Access door(s).

(A) If a hinged door mounting is utilized, the hinge shall be mounted on the inside so that the door opens into the makeup room. In the fully closed position, in position to be locked, the door shall be a minimum of two inches larger than the access opening on all sides.

(B) If a flush door mounting is utilized, the door shall be mounted with a two-inch decreasing taper on all sides of both the door and the concrete access opening to form a wedge seal.

(C) If a sliding door mounting is utilized, the mounting apparatus shall be on the inside of the makeup room and the door shall be a minimum of two inches larger than the access opening when the door is fully closed.

(D) Makeup room door may be either:

(I) Constructed to the same structural integrity and mounting requirements of (a)(iii)(A) through (C) of this subsection; or

(II) Constructed of plywood not less than two inches thick and overlaid on the outside with a steel plate not less than one-eighth inch thick.

(III) If a door which complies with (iii)(D)(II) of this subsection is used, a berm or barricade shall be installed within six feet of the door. The berm or barricade shall extend at least as high as the top of the door and shall be a minimum of two feet wider than the door on both sides of the door.

(E) For security purposes, one steel padlock having at least five tumblers and a case hardened shackle of at least three-eighths inch diameter is sufficient for locking purposes. Hinges and hasps shall be attached so that they cannot be removed from the outside when in the closed position and with the lock in place.

(v) Interior finish. The inside of all makeup rooms shall be finished and equipped to the following minimum requirements:

(A) Construction shall be fire resistant and nonsparking up to the top of the walls. Nails or screws shall be countersunk, blind nailed, or covered.

(B) Lighting shall be by N.E.C. explosion-proof rated fixtures and all wiring shall be in sealed conduit.

(C) Control switches shall be outside the makeup room.

(D) No electrical outlet boxes are permissible inside the room.

(b) Restrictions.

(i) Smoking, matches, open flames, or flame or spark-producing devices shall not be permitted inside the makeup room.

(ii) Flammable liquids or flammable compressed gases shall not be stored in the makeup room.

(iii) Signs limiting entry to authorized personnel shall be posted on the door(s).

(iv) A sign stating the occupancy rules shall be posted inside the makeup room where it is clearly legible upon entering the room. The sign shall post the following rules:

(A) Occupancy shall be restricted to specifically authorized personnel;

(B) Smoking, matches, flame or spark-producing devices, tools or equipment shall not be permitted in the room at any time when explosives or explosive components are present; and

(C) Flammable fuels or compressed gases shall not be permitted inside the room nor stored within fifty feet of the room.

(v) Heating units shall be limited to:

(A) Forced air systems with the heating unit located outside the room.

(B) Steam systems of 15 psig or less.

(C) Hot water systems of 130°F or less.

(D) The radiant heating coils and piping for steam or hot water systems shall be protected so that explosives cannot come into contact with them.

(E) Heating ducts shall be installed so that the hot air does not discharge directly on explosives.

(F) The heating system used in a makeup room shall have controls which prevent the ambient room temperature from exceeding 130°F.

(vi) The makeup room shall be equipped with a portable fire extinguisher of at least 2A-20BC rating.

(vii) Ventilation.

(A) The makeup room shall be equipped with a ventilation system capable of maintaining a minimum rate of three air exchanges per hour during all times when explosives are present in the room.

(B) Fans and controls shall be located outside the makeup room and shall be of a type approved for this service.

(C) The lighting circuit control shall also activate the ventilation fan and the ventilation fan shall be operated whenever personnel are in the room.

(D) Exhaust ventilation shall be arranged to discharge into outside air, not into an enclosed structure.

(viii) The floor or exterior walls may be constructed with duct openings for heating and ventilation purposes provided that:

(A) Each duct opening is not greater in volume than seventy-two square inches;

(B) The combined number of duct openings shall not exceed three;

(C) Duct openings shall be located within twelve inches of the floor or ceiling;

(D) The exhaust duct opening shall not be located on the wall above the makeup workbench.

(c) Practices and procedures.

(i) When explosives are present in the makeup room, entry into the makeup room shall be restricted to trained and authorized personnel.

(ii) The access door(s) to the makeup room shall be kept locked or bolted from the inside while employees are assembling explosives.

(iii) The entire makeup room shall be kept clean, orderly, and free of burnable rubbish.

(iv) Brooms and other cleaning utensils shall not have any spark-producing metal parts if used when explosives are present.

(v) Sweepings and empty explosives containers shall be disposed of as recommended by the explosives supplier.

(vi) Repair activities which utilize spark-producing tools shall not be conducted on any part of the makeup room while explosives are present.

(d) Storage of explosives.

(i) A makeup room shall not be used for the unattended storage of class A explosives.

(ii) A makeup room which meets all requirements of this chapter may contain a class 3 storage facility, for one thousand or less blasting caps.

(iii) A class 3 storage facility shall be constructed to meet the following minimum requirements:

(A) A class 3 storage facility shall be fire resistant and theft resistant. It does not need to be bullet resistant and weather resistant if the locked makeup room provides protection from weather and bullet penetration.

(B) Sides, bottoms, and covers shall be constructed of not less than number twelve gauge metal and lined with a nonsparking material.

(C) Hinges and hasps shall be attached so that they cannot be removed from the outside.

(D) One steel padlock having at least five tumblers and a case-hardened shackle of at least three-eighths inch diameter is sufficient for locking purposes. The lock and hasp is not required to be equipped with a steel hood.

(e) Location.

(i) The makeup room shall be located in accordance with the American Quantity and Distance Separation Tables as adopted in chapter 70.74 RCW "Washington State Explosives Act" and chapter 296-52 WAC "Safety standards for the possession and handling of explosives," except under conditions as indicated in this section.

(ii) Where locating the makeup room in accordance with the quantity and distance separation table is impractical because of bad weather accessibility, rough terrain, or space availability:

(A) Upon application the department will issue a variance enabling location of the makeup room, by mutual agreement, at the safest possible location within the limitation of the individual base area.

(B) The safest possible location will be the location most isolated from assembly areas and buildings that are inhabited with application of additional protection measures such as:

(I) Berming.

(II) Locating natural obstructions or buildings that are not inhabited between the makeup room and assembly areas and buildings that are inhabited.

(III) Limitations on the total quantity of explosives in the makeup room at any one time.

(iii) Makeup rooms designed to hold the boxes of explosives awaiting makeup and the madeup explosives in avalanche control packs awaiting distribution may be located using the total quantity of explosives allowed at the makeup table at any one time as the referenced quantity of explosives provided.

(A) The makeup room is located in accordance with the American Quantity and Distance Separation Tables as adopted in chapter 70.74 RCW "Washington State Explosives Act" and chapter 296-52 WAC "Safety standards for the possession and handling of explosives" for the referenced quantity of explosives at the makeup table.

(I) This separation shall apply only to human proximity to the makeup room and only at such time as there are explosives in the makeup room.

(II) When the makeup room does not contain explosives the separation tables shall not apply.

(B) The concrete walls of the room are designed to withstand the explosion of the total amount of the referenced explosives.

(I) The concrete walls must be constructed in accordance with specifications designed and certified by a licensed engineer; or

(II) The concrete walls must be constructed to the specifications of Department of the Army TM5-1300 "Structures to Resist the Effects of Accidental Explosions" designed to produce walls which will withstand explosion of the referenced quantity explosives.

(C) The boxes of explosives awaiting makeup and the madeup explosives in avalanche control packs awaiting distribution are located behind separate concrete debris barrier walls which will ensure that detonation of these explosives will not occur if the explosives at the makeup table detonate.

(I) The concrete debris barrier wall must be constructed in accordance with specifications designed and certified by a licensed engineer; or

(II) The concrete debris barrier wall must be constructed to the specifications of Department of the Army TM5-1300 "Structures to Resist the Effects of Accidental Explosions" to produce a barrier which will not allow detonation of the explosives awaiting makeup and distribution should the referenced quantity of explosives detonate.

(III) Access from the makeup table to the area behind the concrete debris barrier walls shall not be doored. The concrete debris barrier walls will be designed so that the access way from the makeup table to the area behind the concrete debris barrier wall will deflect debris from an explosive blast by inherent design.

(D) The roof shall be designed so that the resistance to an interior explosive blast will be negligible.

(iv) A full containment makeup room may be located anywhere and must meet the following requirements:

(A) The makeup room must be constructed in accordance with a licensed explosive engineer's approved design.

(B) The total amount of explosives in the room at any time must not exceed the design limit of the room.

(C) The makeup room cannot be used for storage.

(v) This section shall become effective December 1, 1989.

Note: Explosives shall be stored in licensed magazines only. All magazines must be located in compliance with the American Quantity and Distance Separation Tables until the United States Treasury Department Bureau of Alcohol, Tobacco and Firearms approves full containment class 1 magazines for storage at distances less than those specified in the American Standard Quantity and Distance Separation Tables and the Washington state department of labor and industries adopts corresponding amendments.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-105, filed 7/6/88.]

WAC 296-59-107 Avalanche control blasting. (1) The employer shall ensure that all members of avalanche control blasting crews are competent ski mountaineers in good physical and mental condition.

(2) Each avalanche control blasting crew or team shall consist of a qualified and licensed blaster and at least one trained assistant.

(3) Untrained personnel may accompany blasting crews for training purposes but shall not participate in actual firing of charges until trained and authorized.

(4) The blaster in charge of each crew or team shall be responsible for all phases of preparation and placement of charges.

(5) Avalanche control blasting should be conducted during daylight hours whenever possible.

(6) Escape route.

(a) The avalanche control crew or team shall preplan the escape route before igniting any charge.

(b) The escape route shall be as safe and foolproof as possible and shall culminate behind a terrain barrier or at least one hundred feet from the blast site by the time of detonation.

(7) Hand-thrown charges.

(a) A blaster shall only work with one charge at a time.

(b) Before attaching the igniter, the blaster must:

(i) Be at the start of the escape route;

(ii) Check the runout zone for personnel;

(iii) Check the blast area for personnel.

(c) After the blaster attaches and activates the igniter:

(i) The blaster shall check to see that the fuse is ignited;

(ii) If the fuse did not ignite, the blaster may reclip the fuse and attempt to light the fuse again with another igniter;

(iii) As soon as the fuse is ignited, the blaster shall promptly throw the charge into the target area;

(iv) All personnel shall proceed immediately along the escape route as soon as an ignited charge is thrown.

(d) Where hand-thrown charges will slide down the hill on hard frozen snow or ice surface, charges shall be belayed with light cord.

(8) Handcharges thrown from ski lifts or trams.

(a) The number of charges thrown from ski lifts or trams shall be kept to a minimum.

(b) The lift operating crew shall be informed of the blasting plans.

(c) The lift crew shall stand by for emergency procedures such as transfer of lift onto auxiliary power, evacuation, etc.

(d) The lift crew and the blaster in charge shall be in direct radio contact at all times during the blasting operations.

(e) Only the avalanche control blasting crew and the essential lift operating personnel shall be on a lift or tram during blasting operations.

(f) The avalanche control blasting crew shall be traveling up-slope when a charge is thrown.

(g) A charge shall always be thrown down slope and to the side, away from towers, haulropes and other equipment or facilities.

(h) The minimum distance from the blast target to the closest point of the lift shall be sixty feet.

(i) Handcharges shall not exceed 4.5 pounds of TNT equivalent.

(j) Fuses shall be timed and cut to such length that all personnel on the lift will have moved a minimum of three hundred feet from the blast target by the time of detonation.

(k) Precautions shall be taken to avoid tossing charges into any of the lift equipment, moving chairs, cables, towers, etc.

(9) Handcharges thrown from aircraft.

(a) Blasting from aircraft shall require a written program approved by the Federal Aviation Administration and the director of the department of labor and industries.

(b) A written program shall include the following:

(i) Written procedures to be followed including provisions for safety in the avalanche runout zone and emergency rescue plans.

(ii) Handcharge makeup and handling procedures.

(iii) The type of explosives to be used.

(iv) The qualifications of all personnel involved.

(v) The specific locations where aircraft blasting is to take place.

Note: Requests for blasting from aircraft will not be granted unless it is determined that conventional methods are not feasible or are more hazardous.

(10) Avalancher requirements.

(a) Management shall develop a written training program and ensure that every person who will be authorized to work on an avalancher firing team is thoroughly trained. Training shall include:

(i) All operating instructions;

(ii) Safety precautions;

(iii) Emergency procedures;

(iv) Securing requirements for the equipment.

(b) Authorized operators shall be listed on a posted operator's list.

(c) Only trained and authorized personnel shall be permitted to point and fire an avalancher with explosive rounds.

(d) During firing of explosive loaded rounds, the firing team shall consist of two qualified operators and not more than one adequately trained helper.

(e) Operators must have a current state blasting license.

(f) Each operator shall individually check the elevation, pointing and pressure settings of the gun before each shot is fired.

(g) Operators shall attempt to determine and record whether or not each round which is fired actually explodes on contact.

(h) The approximate location of all known duds shall be recorded.

(i) Initial shooting coordinates for each avalancher mount shall be made during periods of good visibility.

(j) Testing shall include test firing in various wind conditions.

(k) The correct coordinates for the various conditions encountered shall be carefully recorded.

(l) When spotter personnel are used in the target area, shooting shall be conducted with nonexplosive projectiles.

(m) Firing of explosive avalancher rounds shall only be conducted when personnel are not in the target area.

(n) The avalancher apparatus shall be stored in a non-functional condition when not in use. This shall be accomplished by:

(i) Locking out the firing mechanism or gas source in accordance with the lockout requirements of this chapter; or

(ii) Disassembly of functional components rendering the gun inoperable and separate storage of components removed; or

(iii) Removal of the entire gun to secure storage.

(o) With established avalancher mounts, each autumn when reinstalling guns, the following procedures shall be accomplished before the gun is considered operable:

(i) All components shall be carefully inspected by qualified personnel;

(ii) After assembly and installation, the gun shall first be test fired using a nonexplosive projectile;

(iii) The established firing coordinates shall be checked by test firing.

(11) Cornice control requirements.

(a) Cornice buildup hazards shall be evaluated regularly by qualified personnel, particularly after heavy snowfall periods which are accompanied by high wind or other snow transport weather conditions.

(b) Cornice hazards shall be controlled whenever the buildup appears to offer potential hazard to areas accessible by personnel.

(c) The control team shall establish the tension breakline of the cornice roof as accurately as conditions permit before starting any other control work on the cornice.

(d) The tension breakline shall be marked when necessary.

(e) Small lightly packed cornices may be kicked off with a ski, ski pole, or shovel by an unbelayed control team member if the ridgeline can be clearly established and all work can be done from the safe side of the ridgeline.

(f) When working along an anticipated cornice breakline, control team members shall retreat back from the breakline to change work positions rather than traverse along the breakline.

(g) The following factors shall be given careful consideration before commencing control activities on any relatively larger cornice:

(i) The older and larger a cornice becomes the more densely it compacts. Densely packed cornices release into larger blocks offering a higher level of danger to an extended

runout zone. The control team leader shall therefore take highest level of precautions to assure that the runout zone is clear of personnel;

(ii) Larger size cornices result in increased suspended weight and leverage which may cause the breakline release fracture to occur behind the actual ridgeline. The actual ridgeline may also be obscured by the simple mass of larger cornices. Control team members shall stay off the cornice roof and must be protected by a secure belay when working near the suspected breakline;

(iii) All large cornices shall be released by explosives. Explosives shall be transported, made up and fired in accordance with the following requirements:

(A) The ignition system for single charge blasts shall be safety fuse and cap.

(B) Detonating cord shall be used to connect multiple charge blasts.

(C) When detonating cord is used, one end shall be securely anchored where premature cornice collapse will not disturb the anchor. The fuse and cap shall be attached to the free end of the detonating cord after all charges are connected to the detonating cord.

(D) Safety fuse length shall be sufficient to permit adequate escapement time for all personnel from the area influenced by the blast. Safety fuse shall be not less than three feet long, approximately two minutes and twenty seconds, in all instances.

(h) Cornice control work on large cornices shall be conducted during daylight hours and preferably during favorable weather conditions. As a minimum, clear visibility shall exist across the full length of any cornice which the control team is attempting to release.

(12) Belaying practices.

(a) Belay rope shall be standard 11 mm mountaineering rope or the equivalent.

(i) Belay rope shall be inspected at not less than thirty day intervals and maintained in excellent condition.

(ii) Defective belay rope shall not be used for belaying purposes.

(b) Adequate trees or other suitable natural belay anchors shall be used in preference to a human belay anchor when such natural anchors are available.

(c) The belay anchor position shall be as near to ninety degrees from the tension breakline as the terrain conditions will permit.

(d) With either a natural belay anchor or human belay anchor, the belay line shall be tended to keep slack out of the line.

(e) When either the belayed person or belay anchor needs to change position, the belayed person shall retreat back from the cornice to a safe position until the belay anchor is reestablished.

(f) When a human belay anchor is used:

(i) The belay anchor person shall establish the anchor position as far back away from the cornice as conditions permit;

(ii) The anchor person shall remain in a seated position with their legs pointed toward the belayed person until such time as the belayed person has retreated back from the cornice to a position considered to be safe.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-107, filed 7/6/88.]

WAC 296-59-109 Retrieving misfires or duds. (1)

The following requirements shall apply to all kinds of avalanche control blasting:

(a) Each person who ignites a charge or propels a charged projectile with any kind of apparatus shall note whether or not the charge actually detonates.

(b) A conscientious effort shall be made to promptly retrieve any misfire or dud.

(i) If conditions make it impractical or dangerous to promptly retrieve a dud, a search shall be conducted as soon as conditions permit.

(ii) Any area which contains a dud shall be closed to entry to all personnel except the search team until such time as the area has been searched and pronounced safe by the designated search leader.

(c) When searching for a dud on an uncontrolled avalanche slope (a slope which has not released), the procedures used shall be consistent with good mountaineering practices.

(d) A handcharge dud shall not be approached for at least fifteen minutes.

(e) Any dud which is aflame or emitting smoke shall not be approached for at least one hour after evidence of combustion ceases.

(f) A handcharge or avalanche dud may be blown up with a secondary charge where they are found or may be disarmed at that location by fully trained and qualified personnel.

(g) Military warhead duds shall not be moved. They shall be blown up where they are found by secondary charges except that trained military personnel may disarm and transport such duds when approved by the governmental branch having jurisdiction.

(2) Records.

(a) Accurate records shall be maintained for every explosive device which does not detonate.

(b) Dud records shall include the following information:

(i) The suspected location;

(ii) A description of the dud;

(iii) The date the dud was lost;

(iv) The date the dud was found and disposed of.

(3) Dud frequency.

(a) Dud frequency should be maintained below one dud for every five hundred detonating attempts.

(b) Any employer who does not maintain a dud frequency below one dud per five hundred detonation attempts shall investigate all aspects of the blasting program and take prompt corrective actions as indicated.

(4) Dud warning signs.

(a) Ski area operations which use any form of explosive device for avalanche control shall display warning and information placards and/or signs.

(b) Signs shall be posted at readily visible locations and in such a manner as to give both employees and the public ample opportunity to be informed of the potential existence of dud avalanche charges. Locations may include but are not limited to:

(i) Ticket sales and lift loading areas;

(ii) Food and beverage service facilities;

(iii) Restrooms and locker rooms;

(iv) Safety bulletin boards;

(v) Along general access routes.

(c) Signs shall be distinctive in appearance from the surrounding background where they are posted.

(d) Signs shall be maintained in legible condition.

(e) Signs shall include the following information:

(i) The word "WARNING" or "DANGER" at the top of the sign in the largest lettering on the sign;

(ii) The words "Explosives on the mountain";

(iii) A colored pictorial illustration which also provides information on dimensions of each type of explosive device used in the area;

(iv) The sign wording shall conclude with specific instructions to be followed by anyone who locates an unexploded explosive device.

Note: An example dud warning sign is illustrated in Appendix I.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-109, filed 7/6/88.]

WAC 296-59-115 Ski lift facilities and structures. (1)

Existing ski lift facilities and structures shall not be required to be retrofitted with standard construction work platforms, walkways, stairs or guardrails on exterior surfaces when such features would add significantly to snow loading considerations. When such standard protective features are omitted, alternative personal protective measures shall be used where possible. Examples include but are not limited to: Safety belt and lanyard, ladder climbing safety devices, temporary work platforms or scaffolds, temporary or removable handrails, guardrails, or walkways.

(2) Snow removal.

(a) During the operating season, standard guardrails which would interfere with snow removal may be omitted in areas where it can be anticipated that frequent snow removal will be necessary to maintain operability of ski lift apparatus. Examples could include but are not limited to the motor house roof or loading and unloading areas.

(b) Personnel barricades, signs, or other devices shall be used to deflect traffic or warn personnel of existing fall hazards.

(3) All ski lift towers installed after the effective date of this standard shall be equipped with permanent ladders or steps which meet the following minimum requirements:

(a) The minimum design live load shall be a single concentrated load of two hundred pounds.

(b) The number and position of additional concentrated live load units of two hundred pounds each as determined from anticipated usage of the ladder shall be considered in the design.

(c) The live loads imposed by persons occupying the ladder shall be considered to be concentrated at such points as will cause the maximum stress in the structural member being considered.

(d) The weight of the ladder and attached appurtenances together with the live load shall be considered in the design of rails and fastenings.

(e) All rungs shall have a minimum diameter of three-fourths inch.

(f) The distance between rungs on steps shall not exceed twelve inches and shall be uniform throughout the ladder length. The top rung shall be located at the level of the landing or equipment served by the ladder.

(g) The minimum clear length of rungs or steps shall be sixteen inches on new installations.

(h) Rungs, cleats, and steps shall be free of sharp edges, burrs, or projections which may be a hazard.

(i) The rungs of an individual-rung ladder shall be so designed that the foot cannot slide off the end. (A suggested design is shown in Figure D-1, at the end of this section.)

(j) Side rails which might be used as a climbing aid shall be of such cross sections as to afford adequate gripping surface without sharp edges or burrs.

(k) Fastenings. Fastenings shall be an integral part of fixed ladder design.

(l) All splices made by whatever means shall meet design requirements as noted in (a) of this subsection. All splices and connections shall have smooth transition with original members and with no sharp or extensive projections.

(m) Adequate means shall be employed to protect dissimilar metals from electrolytic action when such metals are joined.

(n) Welding. All welding shall be in accordance with the "Code for Welding in Building Construction" (AWS D1.0-1966).

(o) Protection from deterioration. Metal ladders and appurtenances shall be painted or otherwise treated to resist corrosion and rusting when location demands.

(4) Installation and clearance.

(a) Pitch.

(i) The preferred pitch of fixed ladders is between the range of seventy-five degrees and ninety degrees with the horizontal (Figure D-4).

(ii) Substandard pitch. Fixed ladders shall be considered as substandard if they are installed within the substandard pitch range of forty-five and seventy-five degrees with the horizontal. Substandard fixed ladders are permitted only where it is found necessary to meet conditions of installation. This substandard pitch range is considered as a critical range to be avoided, if possible.

(iii) Pitch greater than ninety degrees. Ladders having a pitch in excess of ninety degrees with the horizontal are prohibited.

(b) Clearances.

(i) The perpendicular distance from the centerline of the rungs to the nearest permanent object on the climbing side of the ladder shall be thirty-six inches for a pitch of seventy-six degrees, and thirty inches for a pitch of ninety degrees (Figure D-2), with minimum clearances for intermediate pitches varying between these two limits in proportion to the slope.

(ii) A clear width of at least fifteen inches shall be provided each way from the centerline of the ladder in the climbing space.

(iii) The side rails of through or side-step ladder extensions shall extend three and one-half feet above parapets and landings.

(A) For through ladder extensions, the rungs shall be omitted from the extension and shall have not less than eight

teen nor more than twenty-four inches clearance between rails.

(B) For side-step or offset fixed ladder sections, at landings, the side rails and rungs shall be carried to the next regular rung beyond or above the three and one-half feet minimum.

(iv) Grab bars shall be spaced by a continuation of the rung spacing when they are located in the horizontal position. Vertical grab bars shall have the same spacing as the ladder side rails. Grab bar diameters shall be the equivalent of the round-rung diameters.

(v) Clearance in back of ladder. The distance from the centerline of rungs, cleats, or steps to the nearest permanent object in back of the ladder shall be not less than seven inches, except that when unavoidable obstructions are encountered, minimum clearances as shown in Figure D-3 shall be provided.

(vi) Clearance in back of grab bar. The distance from the centerline of the grab bar to the nearest permanent object in back of the grab bars shall be not less than four inches. Grab bars shall not protrude on the climbing side beyond the rungs of the ladder which they serve.

(c) The step-across distance from the nearest edge of a ladder to the nearest edge of the equipment or structure shall be not more than twelve inches, or less than two and one-half inches. However, the step-across distance may be as much as twenty inches provided:

(i) The climber is wearing a safety belt and lanyard; and

(ii) The lanyard is attached to the tower structure before the climber steps off the ladder.

(5) Ski lift towers are not required to be equipped with ladder cages, platforms or landings.

(6) Maintenance and use.

(a) All ladders shall be maintained in a safe condition. All ladders shall be inspected regularly, with the intervals between inspections being determined by use and exposure.

(b) When ascending or descending, the climber must face the ladder.

(c) Personnel shall not ascend or descend ladders while carrying tools or materials which could interfere with the free use of both hands.

(7) Personnel shall be provided with and shall use ladder safety devices or safety belt and lanyard whenever feasible.

(8) Personnel shall not place mobile equipment or personal equipment such as skis, ski poles, or large tools within the falling radius of the lift tower while climbing or working on the lift tower.

(9) Ski lift towers and terminals are not required to be equipped with sheave guards on the haulrope wheels.

(10) Ski lift towers are not required to be equipped with work platforms.

(11) Personnel shall use personal protective equipment such as a safety belt and lanyard when working at unprotected elevated locations. Exception to this requirement shall only be permitted for emergency rescue or emergency inspection if a safety belt and lanyard is not immediately available. Required personal protective equipment shall be made available as quickly as possible.

(12) When fixed ladders on towers do not reach all the way down to the ground or snow level, a specifically

designed and constructed portable ladder shall be used for access to and from the fixed ladder. Portable ladders shall be constructed and maintained to the following requirements:

(a) The portable ladder shall be constructed in accordance with applicable provisions of subsection (3) of this section.

(b) The portable ladder shall be constructed with a minimum of two attachment hooks near the top to be utilized for securing the portable ladder onto the fixed ladder.

(c) The attachment hooks shall be installed to support the portable ladder near the fixed ladder siderails.

(d) Rungs or steps on the portable ladder shall be spaced to be identical with rungs or steps on the fixed ladder when the portable ladder is attached for use. The design criteria shall be to achieve a horizontal plane relationship on the top (walking surface) portion of both steps when overlapping is necessary.

(e) The portable ladder shall be equipped with a hold-out device near the bottom to assure clearance behind the steps as required by subsection (4)(b)(v) of this section.

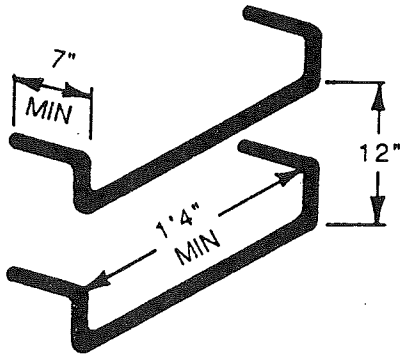


FIGURE D-1

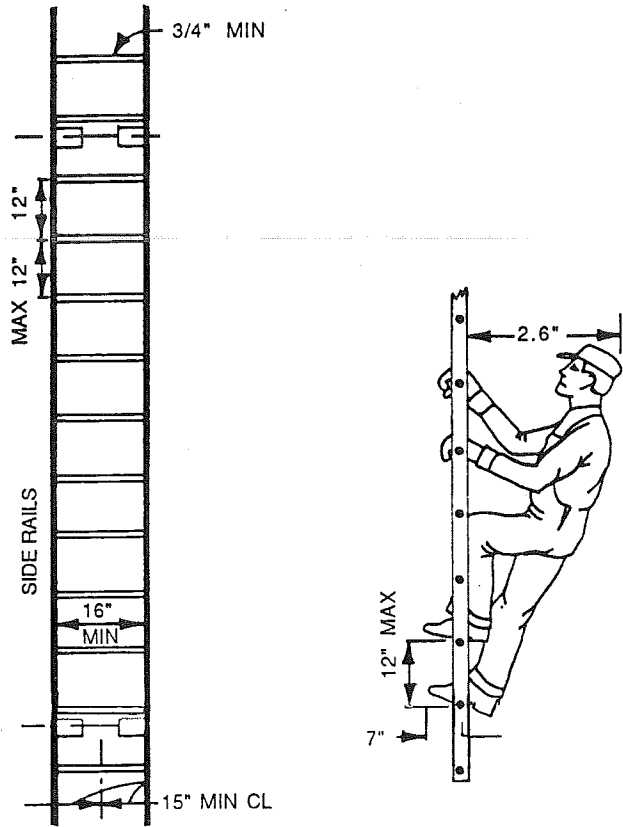


FIGURE D-2
Minimum Ladder Clearance

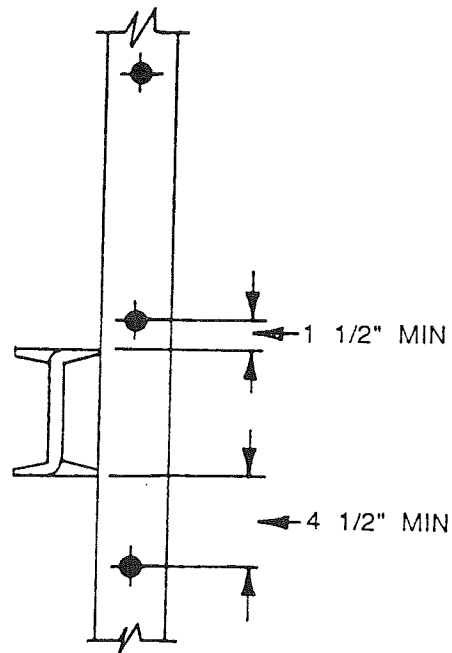


FIGURE D-3
Clearance for Unavoidable Obstruction
at Rear of Fixed Ladder.

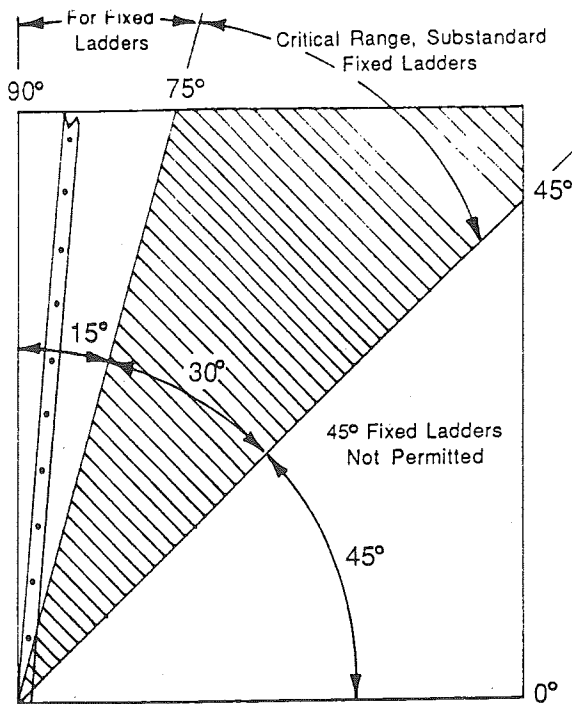


FIGURE D-4
Fixed Ladder Range

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-115, filed 7/6/88.]

WAC 296-59-120 Ski lift operations. (1) Operators.

- (a) Only trained and qualified lift operators shall be permitted to operate any lift while it is carrying passengers.
- (b) Management designated trainees shall only be permitted to operate a lift while under the direct supervision of a qualified operator or trainer.
- (c) Initial training of operators shall be accomplished when the lift is not carrying passengers.
- (d) Operator training shall include:
 - (i) Standard and emergency start-up procedures;
 - (ii) Standard and emergency stopping procedures;
 - (iii) Lockout procedures;
 - (iv) Corrective actions for operating malfunctions;
 - (v) Specific instructions on who to contact for different kinds of rescue emergencies;
 - (vi) Specific instructions on standard operating procedures with respect to the hazard of loading or unloading passengers proximate to the moving lift chairs.
- (2) Operators and helpers shall prepare and maintain the loading and unloading work stations in a leveled condition and, to the extent possible, free from slipping hazards caused by ice, ruts, excessive snow accumulation, tools, etc.
- (3) Daily start-up procedure.

- (a) Loading station operators shall test all operating controls and stopping controls before permitting any personnel or passengers to load on the lift.
- (b) The lift must travel a distance of two times the longest tower span before any employee can load on a chair to go to the remote station.
- (c) A qualified operator shall be the first passenger on each lift each day.

(2001 Ed.)

Exception: The avalanche control team and the emergency rescue team may use any operable lift at anytime for that work. They may use lifts without a remote operator provided that direct communications are maintained to the operator and the operator has successfully completed normal daily safety and operating control checks at the operating station in use.

(d) Enroute to the remote station, the remote operator shall visually inspect each tower as the chair or gondola proceeds to the remote station.

(e) The remote operator shall stop the system when he/she has reached the remote control station. The operator shall then conduct the daily safety and operating control checks on the remote station.

(f) The remote operator shall ensure that the unloading area is groomed to adequately accommodate normal unloading.

(g) When all controls are checked and functioning correctly and the unloading area is prepared, the remote operator shall communicate to the operator that the system can be placed in normal operation.

(4) Operators shall report to their work station wearing adequate clothing for inclement weather which may be encountered. This requirement shall include reasonably water resistant footwear which shall have a slip resistant sole tread.

(5) While the lift is in operation and carrying passengers, operators shall not permit any activity in the loading/unloading areas which could distract their attention from the principle duty of safely loading or unloading passengers.

(6) Means of communication shall be maintained between the top operator and bottom operator stations.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-120, filed 7/6/88.]

WAC 296-59-125 Ski lift aerial work platforms. (1) Construction and loading.

- (a) All aerial work platforms shall be constructed to sustain the permissible loading with a safety factor of four. The load permitted shall be calculated to include:
 - (i) The weight of the platform and all suspension components;
 - (ii) The weight of each permitted occupant calculated at two hundred fifty pounds per person including limited handtools;
 - (iii) The weight of any additional heavy tools, equipment, or supplies for tasks commonly accomplished from the work platform.
- (b) The floor of the platform shall not have openings larger than two inches in the greatest dimension.
- (c) The platform shall be equipped with toeboards at least four inches high on all sides.
- (d) Guardrails.
 - (i) The platform shall be equipped with standard height and strength guardrails where such guardrails will pass through the configuration of all lifts on which it is intended to be used.
 - (ii) Where guardrails must be less than thirty-six inches high in order to clear carriages, guideage, etc., guardrails shall be as high as will clear the obstructions but never less than twelve inches high.

(iii) If the work platform is equipped with an upper work level, the upper level platform shall be equipped with a toe-board at least four inches high.

(iv) Each platform shall be equipped with a lanyard attachment ring for each permissible occupant to attach a safety belt lanyard.

(v) Each lanyard attachment ring shall be of such strength as to sustain five thousand four hundred pounds of static loading for each occupant permitted to be attached to a specific ring.

(vi) Attachment rings shall be permanently located as close to the center balance point of the platform as is practical.

(vii) The rings may be movable, for instance, up and down a central suspension rod, but shall not be completely removable.

(e) Platform attachment.

(i) The platform shall be suspended by either a standard wire rope four part bridle or by solid metal rods, bars, or pipe.

(ii) The attachment means chosen shall be of a type which will prevent accidental displacement.

(iii) The attachment means shall be adjusted so that the platform rides level when empty.

(f) Maintenance.

(i) Every aerial work platform shall be subjected to a complete annual inspection by qualified personnel.

(ii) The inspection shall include all structural members, welding, bolted or treaded fittings, and the suspension components.

(iii) Any defect noted shall be repaired before the platform is placed back in service.

(iv) A written record shall be kept for each annual inspection. The record shall include:

(A) The inspector identification;

(B) All defects found;

(C) The identity of repair personnel;

(D) Identity of the post-repair inspector who accepted the platform for use.

(g) The platform shall be clearly identified as to the number of permissible passengers and the weight limit of additional cargo permitted.

(i) Signs shall be applied on the outside of each side panel.

(ii) Signs shall be maintained in clearly legible condition.

(h) Unless the side guardrail assembly is at least thirty-six inches high on all sides, signs shall be placed on the inside floor or walls to clearly inform all passengers that they must use a safety belt and lanyard at all times when using the platform.

(2) Work platform use.

(a) Platforms shall be attached to the haulrope with an attachment means which develops a four to one strength factor for the combined weight of the platform and all permissible loading.

(b) The haulrope attachment means shall be designed to prevent accidental displacement.

(c) Trained and competent personnel shall attach and inspect the platform before each use.

(d) Passengers shall be provided with and shall use the correct safety harness and lanyard for the intended work.

(e) Any time a passenger's position is not protected by a standard guardrail at least thirty-six inches high, the individual shall be protected by a short lanyard which will not permit free-fall over the platform edge.

(f) When personnel are passengers on a work platform and their work position requires the use of a safety harness and lanyard, the lanyard shall be attached to the work platform, not to the haulrope or tower.

(g) Work platform passengers shall face in the direction of travel when the lift is moving.

(h) Tools, equipment and supplies shall be loaded on the platform in such a fashion that the loaded platform can safely pass all towers and appurtenances.

(i) Heavy tools, equipment or supplies shall be secured in place if they could fall over or roll within the platform and create a hazard for passengers.

(j) When the work crew is traveling on the work platform, the lift shall be operated at a speed which is safe for that particular system and the conditions present.

Note: See Appendix 2 for operating procedure requirements.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-125, filed 7/6/88.]

WAC 296-59-130 Ski lift machinery guarding. (1)

Moving machine parts that are located within normal reach shall be fitted with safety guards in compliance with WAC 296-24-150 through 296-24-20533, Machinery and machine guarding.

(a) The coupling apparatus for the ski lift emergency drive may be provided with a removable or swing guard.

(b) When removable or swing guards are used, the guard and mounting means shall be so designed and constructed as to sustain a two hundred fifty pound weight loading without displacement.

(2) All guards shall be maintained in good condition and shall be secured in place when the equipment is in operation except for inspection and adjustment purposes.

(3) The drive machinery and primary control apparatus shall be installed in a facility which can prevent access by unauthorized personnel. The access door shall have a sign which states that entry is restricted to authorized personnel.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-59-130, filed 7/6/88.]

WAC 296-59-135 Appendix 1—Nonmandatory alternative lock-out procedure for ski lifts and tows. (1)

To ensure the safety of all personnel engaged in lift maintenance activities, we insist that the following procedure be strictly adhered to.

(a) Criteria.

(i) Equipment shall be deactivated and locked or tagged out before an employee is placed in a position where there is a hazard created by exposure to the components of ski lift or tows, equipment and/or systems.

(ii) This procedure relies on positive communication to indicate when lock-out safety is assured. At any time this crew is working at a location remote from the control station,

this procedure shall be used by only one work crew whose members are working in close proximity to one another.

(iii) The operator and all potentially exposed employees shall have a positive means of communication at all times. If anyone loses the communication means, it shall be restored before exposure can occur or lock-out or tag-out can be broken.

(iv) Other radio transmissions breaking in or overriding the communications between control operator and remote work crew, if not controlled, can be a problem. There are considerations that should be followed:

(A) The first preferred method is to provide an isolated radio channel for communications between operator and remote work crew.

(B) If an isolated radio frequency is not possible, the entire area crew should be trained to recognize the radio conversation characteristics of this type of work to be notified when the work is in progress and be required to restrict use of their radios.

(v) All personnel working under this procedure shall be thoroughly trained in the specific procedures to be followed and their individual requirements. The ski lift or tow controls shall be under control of a fully qualified operator at all times.

(vi) Signs shall be posted in motor rooms on the control panel or the master disconnect stating "men working on lifts."

(vii) The control operator shall not leave the close proximity of the control station unless the master disconnect is thrown to the off position and padlocked.

(viii) The "standby drive" shall be locked out of service in such a manner that precludes the operation of the lift by jumping ignition, throwing a clutch, or hooking up a coupling, etc., whenever work is being performed on the equipment or system.

Methods for securing "standby drive" may be, but are not limited to the following:

(A) Removal to secure a location or locking up "standby" drive coupling chain, belts, etc.;

(B) Denying access to the standby motor by locking motor room door.

(ix) When the crew is working at either terminal in proximity of bullwheels, shafts, guideage, gears, belts, chains, etc., the master disconnect shall be thrown to the off position and padlocked.

(b) Work chair.

(i) Prior to crew loading on work chair, controls and communications shall be thoroughly checked to confirm that they are in good working condition.

(ii) The operator and work crew shall discuss and determine the safe speed for that particular lift. At no time shall the work chair travel around either terminal bullwheel except at a very slow speed.

(iii) Employees riding in the work chair shall face the direction of travel when chair is in motion.

(iv) Employees in work chair shall pay special attention to ensure that equipment or tools, etc., will not be entangled on towers, ramps, or terminals as work chair passes by.

(v) Safety belts are required and there is a designated device on each work chair to hook onto. At no time will it be allowed to hook onto the tower or tower equipment while in

the work chair, or hook onto a moving part of the lift if standing on the tower.

(c) Operator and controls.

(i) Manual reset stop switches are required on all lifts. The operator shall check and confirm that the lift cannot be started from any control location when the stop switch is depressed. The operator will leave the stop switch depressed until remote crew directs that they are ready to move.

(ii) Communications between operator and remote work crew will be on name basis. This is especially important if there are other radio communications or other crews working on other lifts.

(2) Summation.

(a) If all these rules are adhered to, the operator can use the control circuit stop switch for repetitive type maintenance on towers. If the remote crew is to be at the location for some time, it is recommended that the operator throw the master disconnect switch to the off position and padlock it.

(b) A padlock on the disconnect switch is required when anybody is working on either terminal.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-59-135, filed 11/14/88.]

Chapter 296-62 WAC

GENERAL OCCUPATIONAL HEALTH STANDARDS

WAC

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DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

- 296-62-030 Revisions. [Order 70-8, § 296-62-030, filed 7/31/70, effective 9/1/70; Rule 3.010, effective 8/1/63.] Repealed by Order 73-3, filed 5/7/73.
- 296-62-07007 Labeling of chemical agents. [Order 73-3, § 296-62-07007, filed 5/7/73.] Repealed by 90-09-026 (Order 90-01), filed 4/10/90, effective 5/25/90. Statutory Authority: Chapter 49.17 RCW.
- 296-62-07119 Identification of air-purifying respirator canisters. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07119, filed 7/27/81.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-07121 Effective date. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07121, filed 7/27/81.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-07301 4-Nitrophenyl. [Order 74-35, § 296-62-07301, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.
- 296-62-07303 Alpha-Naphthylamine. [Order 74-35, § 296-62-07303, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.
- 296-62-07305 4,4'-Methylene bis (2-chloroaniline). [Order 74-35, § 296-62-07305, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.
- 296-62-07307 Methyl chloromethyl ether. [Order 74-35, § 296-62-07307, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.
- 296-62-07309 3,3'-Dichlorobenzidine (and its salts). [Order 74-35, § 296-62-07309, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority:

	RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.		
296-62-07311	Bis-Chloromethyl ether. [Order 74-35, § 296-62-07311, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07379	Dates. [Statutory Authority: Chapter 49.17 RCW 88-23-054 (Order 88-25), § 296-62-07379, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07379, filed 11/30/87.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07313	Beta-Naphthylamine. [Order 74-35, § 296-62-07313, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07431	Dates. [Statutory Authority: Chapter 49.17 RCW 93-07-044 (Order 93-01), § 296-62-07431, filed 3/13/93, effective 4/27/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07315	Benzidine. [Order 74-35, § 296-62-07315, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07445	Appendix C—Qualitative and quantitative fit testing procedures—(Fit test protocols). [Statutory Authority: Chapter 49.17 RCW 96-09-030, § 296-62-07445, filed 4/10/96, effective 6/1/96; 93-21-075 (Order 93-06), § 296-62-07445, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07445, filed 3/13/93, effective 4/27/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07317	4-Aminodiphenyl. [Order 74-35, § 296-62-07317, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07533	Appendix E qualitative and quantitative fit testing procedures. [Statutory Authority: Chapter 49.17 RCW 96-09-030, § 296-62-07533, filed 4/10/96, effective 6/1/96; 94-15-096 (Order 94-07), § 296-62-07533, filed 7/20/94, effective 9/20/94; 88-21-002 (Order 88-23), § 296-62-07533, filed 10/6/88, effective 11/7/88.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07319	Ethyleneimine. [Order 76-6, § 296-62-07319, filed 3/1/76.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07550	Appendix E—Qualitative and quantitative fit testing procedures. [Statutory Authority: Chapter 49.17 RCW 96-09-030, § 296-62-07550, filed 4/10/96, effective 6/1/96; 88-21-002 (Order 88-23), § 296-62-07550, filed 10/6/88, effective 11/7/88.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07321	Beta-Propiolactone. [Order 74-35, § 296-62-07321, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07635	Effective date. [Statutory Authority: Chapter 49.17 RCW 93-04-111 (Order 92-15), § 296-62-07635, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07323	2-Acetylaminofluorene. [Order 74-35, § 296-62-07323, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07639	Startup dates. [Statutory Authority: Chapter 49.17 RCW 93-04-111 (Order 92-15), § 296-62-07639, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07325	4-Dimethylaminoazobenzene. [Order 74-35, § 296-62-07325, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07662	Appendix E to WAC 296-62-076—Qualitative and quantitative fit testing procedures. [Statutory Authority: Chapter 49.17 RCW 93-04-111 (Order 92-15), § 296-62-07662, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07327	N-Nitrosodimethylamine—Carcinogen standard report form. [Order 74-35, § 296-62-07327 and Carcinogen Standard Report Form, filed 9/20/74.] Repealed by 80-17-014 (Order 80-20), filed 11/13/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW.	296-62-07664	Appendix E-1—Qualitative fit test protocols. [Statutory Authority: Chapter 49.17 RCW 93-04-111 (Order 92-15), § 296-62-07664, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07335	Benzene. [Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30, and 43.22 RCW 78-09-092 (Order 78-16), § 296-62-07335, filed 8/31/78.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-62-07666	Appendix E-1-a—Isoamyl acetate (banana oil) protocol. [Statutory Authority: Chapter 49.17 RCW 93-04-111 (Order 92-15), § 296-62-07666, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07341	Acrylonitrile. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-07341, filed 7/25/86. Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 81-18-029 (Order 81-21), § 296-62-07341, filed 8/27/81; 81-16-015 (Order 81-20), § 296-62-07341, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-07341, filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30, and 43.22 RCW 78-07-052 (Order 78-10), § 296-62-07341, filed 6/28/78.] Repealed by 88-11-021 (Order 88-04), filed 5/11/88. Statutory Authority: Chapter 49.17 RCW.	296-62-07668	Appendix E-1-b—Saccharin solution aerosol protocol. [Statutory Authority: Chapter 49.17 RCW 96-09-030, § 296-62-07668, filed 4/10/96, effective 6/1/96; 93-04-111 (Order 92-15), § 296-62-07668, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07345	1,2-Dibromo-3-chloropropane. [Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-07345, filed 7/25/86. Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 81-18-029 (Order 81-21), § 296-62-07345, filed 8/27/81; 81-16-015 (Order 81-20), § 296-62-07345, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-07345, filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240, chapters 42.30, and 43.22 RCW 78-07-052 (Order 78-10), § 296-62-07345, filed 6/28/78.] Repealed by 88-11-021 (Order 88-04), filed 5/11/88. Statutory Authority: Chapter 49.17 RCW.	296-62-07670	Appendix E-1-c—Irritant fume protocol. [Statutory Authority: Chapter 49.17 RCW 93-04-111 (Order 92-15), § 296-62-07670, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-62-07349	Lead. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-07349, filed 8/27/81; 81-16-015 (Order 81-20), § 296-62-07349, filed 7/27/81; 80-11-009 (Order 80-16), § 296-62-07349, filed 8/8/80.] Decodified by 82-13-045 (Order 82-22), filed 6/11/82. Statutory Authority: RCW 49.17.040 and 49.17.050. Later promulgation, see WAC 296-62-07521.	296-62-07672	Appendix E-2—Quantitative fit test procedures. [Statutory Authority: Chapter 49.17 RCW 93-04-111 (Order
296-62-07353	Ethylene oxide. [Statutory Authority: RCW 49.17.050(2) and 49.14.040 [49.17.040]. 87-07-022 (Order 87-01), § 296-62-07353, filed 3/12/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-07353, filed 7/25/86; 85-10-		

- 92-15), § 296-62-07672, filed 2/3/93, effective 3/15/93.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-07707 Identification. [Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-62-07707, filed 10/10/89, effective 11/24/89; 87-24-051 (Order 87-24), § 296-62-07707, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07707, filed 4/27/87.] Repealed by 97-01-079, filed 12/17/96, effective 3/1/97. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060.
- 296-62-07729 Observation of monitoring. [Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07729, filed 4/27/87.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.
- 296-62-07731 Dates. [Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), § 296-62-07731, filed 1/10/91, effective 2/12/91; 89-11-035 (Order 89-03), § 296-62-07731, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07731, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07731, filed 4/27/87.] Repealed by 97-01-079, filed 12/17/96, effective 3/1/97. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060.
- 296-62-07739 Appendix C—Qualitative and quantitative fit testing procedures—Mandatory. [Statutory Authority: Chapter 49.17 RCW. 96-09-030, § 296-62-07739, filed 4/10/96, effective 6/1/96; 87-24-051 (Order 87-24), § 296-62-07739, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07739, filed 4/27/87.] Repealed by 99-10-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-07761 Nonasbestiform tremolite, anthophyllite, and actinolite. [Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07761, filed 11/30/87.] Repealed by 97-19-014, filed 9/5/97, effective 11/5/97. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060.
- 296-62-09011 Occupational noise exposure. [Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-09011, filed 1/15/82. Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 81-16-016 (Order 81-19), § 296-62-09011, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-09011, filed 8/8/80; Order 73-3, § 296-62-09011, filed 5/7/73.] Repealed by 83-24-013 (Order 83-34), filed 11/30/83. Statutory Authority: RCW 49.17.040 and 49.17.050.
- 296-62-120 Respiratory protection. [Order 70-8, § 296-62-120 filed 7/31/70, effective 9/1/70; Rule 12.010, effective 8/1/63.] Repealed by Order 73-3, filed 5/7/73.
- 296-62-140 Industrial sanitation. [Order 70-8, § 296-62-140, filed 7/31/70, effective 9/1/70; Rule 14.010, effective 8/1/63.] Repealed by Order 73-3, filed 5/7/73.
- 296-62-145 Permit-required confined spaces. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-145, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-145 reference section, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14500 Scope and application. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14500, filed 1/18/95, effective 3/1/95.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14501 Definitions. [Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 95-17-036, § 296-62-14501, filed 8/9/95, effective 9/25/95. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14501, filed 1/18/95, effective 3/1/95; 91-24-017 (Order 91-07), § 296-62-14501, filed 11/22/91, effective 12/24/91. RCW 49.17.040, 49.17.050, and 49.17.240. 80-11-010 (Order 80-14), § 296-62-14501, filed 8/8/80; Order 73-3, § 296-62-14501, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14503 General requirements. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14503, filed 1/18/95, effective 3/1/95; 91-11-070 (Order 91-01), § 296-62-14503, filed 5/20/91, effective 6/20/91; Order 73-3, § 296-62-14503, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14505 Permit-required confined space program (permit space program). [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14505, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14505, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14507 Permit system. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14507, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 81-16-015 (Order 81-20), § 296-62-14507, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-14507, filed 8/8/80; Order 73-3, § 296-62-14507, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14509 Entry permit. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14509, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14509, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14511 Training. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14511, filed 1/18/95, effective 3/1/95; 91-24-017 (Order 91-07), § 296-62-14511, filed 11/22/91, effective 12/24/91; Order 73-3, § 296-62-14511, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14513 Duties of authorized entrants. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14513, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14513, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14515 Duties of attendants. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14515, filed 1/18/95, effective 3/1/95; 91-24-017 (Order 91-07), § 296-62-14515, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-15-017 (Order 83-19), § 296-62-14515, filed 7/13/83, effective 9/12/83; 82-13-045 (Order 82-22), § 296-62-14515, filed 6/11/82; Order 73-3, § 296-62-14515, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14517 Duties of entry supervisors. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14517, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14517, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14519 Rescue and emergency services. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14519, filed 1/18/95, effective 3/1/95; 91-24-017 (Order 91-07), § 296-62-14519, filed 11/22/91, effective 12/24/91; Order 73-3, § 296-62-14519, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14520 Appendices to WAC 296-62-145—Permit-required confined spaces. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14520, filed 1/18/95, effective 3/1/95.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14521 Appendix A—Permit-required confined space decision flow chart. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14521, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14521, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14523 Appendix B—Procedures for atmospheric testing. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14523, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14523, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- 296-62-14525 Appendix C—Examples of permit-required confined space programs. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14525, filed 1/18/95, effective 3/1/95; 91-11-070 (Order 91-01), § 296-62-14503, filed 5/20/91, effective 6/20/91; Order 73-3, § 296-62-14503, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.

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- tive 3/1/95; 91-24-017 (Order 91-07), § 296-62-14525, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-14525, filed 1/15/82; Order 73-3, § 296-62-14525, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- Appendix D—Sample permits. [Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14527, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14527, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- Appendix E—Sewer system entry. [Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 95-17-036, § 296-62-14529, filed 8/9/95, effective 9/25/95. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-14529, filed 1/18/95, effective 3/1/95; Order 73-3, § 296-62-14529, filed 5/7/73.] Repealed by 99-22-046, filed 10/29/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
- Exposure to cotton dust in cotton gins. [Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 81-18-029 (Order 81-21), § 296-62-14531, filed 8/27/81; 81-16-015 (Order 81-20), § 296-62-14531, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-14531, filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-02-037 (Order 79-1), § 296-62-14531, filed 1/23/79.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.
- Appendices. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-146, filed 8/27/81.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.
- Appendix A—Requirements for classification and respiratory use of workers exposed to cotton dust in gins. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-14601, filed 8/27/81.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- Appendix B-1—Respiratory questionnaire. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-14603, filed 8/27/81.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.
- Appendix C—Spirometry prediction tables for normal males and females. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-14605, filed 8/27/81.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- Appendix D—Pulmonary function standards for cotton dust standard. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-14607, filed 8/27/81.] Repealed by 88-23-054 (Order 88-25), filed 11/14/88. Statutory Authority: Chapter 49.17 RCW.
- Appendix I—Threshold limit values for 1969. [Order 70-8, § 296-62-150, filed 7/31/70, effective 9/1/70; Rules (part), effective 12/1/63.] Repealed by Order 73-3, filed 5/7/73.
- Appendix I—Adopted values. [Order 70-8, § 296-62-155, filed 7/31/70, effective 9/1/70; Rules (part), effective 12/1/63.] Repealed by Order 73-3, filed 5/7/73.
- Threshold limit values of physical agents for 1969. [Order 70-8, § 296-62-157, filed 7/31/70, effective 9/1/70.] Repealed by Order 73-3, filed 5/7/73.
- Appendix II—Levels of illumination currents. [Appendix II, effective 12/1/63.] Repealed by Order 70-8, filed 7/31/70, effective 9/1/70. Also repealed by Order 73-3, filed 5/7/73.
- Appendix III—Nonionizing radiation. [Order 70-8, § 296-62-165, filed 7/31/70, effective 9/1/70; Appendix III, effective 8/1/63.] Repealed by Order 73-3, filed 5/7/73.
- Appendix IV—Temperature, radiant heat, humidity, or air velocity combinations. [Order 70-8, § 296-62-170, filed 7/31/70, effective 9/1/70; Appendix IV, effective 8/1/63.] Repealed by Order 73-3, filed 5/7/73.
- References. [Order 70-8, § 296-62-175, filed 7/31/70, effective 9/1/70.] Repealed by Order 73-3, filed 5/7/73.
- 296-62-180
296-62-185
296-62-3112
296-62-3150
296-62-900
296-62-901
296-62-902
296-62-903
296-62-904
296-62-905
296-62-906
296-62-907
296-62-908
- Appendix V—Use and care of respiratory protective equipment, compressed air supply for respirators. [Order 70-8, § 296-62-180, filed 7/31/70, effective 9/1/70.] Repealed by Order 73-3, filed 5/7/73.
- References. [Order 70-8, § 296-62-185, filed 7/31/70, effective 9/1/70.] Repealed by Order 73-3, filed 5/7/73.
- Emergency response to hazardous substance releases. [Statutory Authority: Chapter 49.17 RCW. 90-20-091 (Order 90-14), § 296-62-3112, filed 10/1/90, effective 11/15/90; 89-21-018, § 296-62-3112, filed 10/10/89, effective 11/24/89.] Repealed by 99-07-097, filed 3/23/99, effective 6/23/99. Statutory Authority: RCW 49.17.040.
- Start-up dates. [Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-3150, filed 10/6/88, effective 11/7/88.] Repealed by 89-21-018 (Order 89-10), filed 10/10/89, effective 11/24/89. Statutory Authority: Chapter 49.17 RCW.
- Note on application of appendices A through H. [Order 73-3, Note (codified as WAC 296-62-900), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix A. [Order 73-3, Appendix A (codified as WAC 296-62-901), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix B. [Order 73-3, Appendix B (codified as WAC 296-62-902), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix C—Threshold limit values for mixtures. [Order 73-3, Appendix C (codified as WAC 296-62-903), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix D—Permissible excursions for time-weighted average (TWA) limits. [Order 73-3, Appendix D (codified as WAC 296-62-904), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix E—Some nuisance particulates (see note q). [Order 73-3, Appendix E (codified as WAC 296-62-905), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix F. [Order 73-3, Appendix F (codified as WAC 296-62-906), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix G—Notice of intended changes (for 1972). [Order 73-3, Appendix G (codified as WAC 296-62-907), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- Appendix H—Notice of intent to change the TLV for lasers-1972. [Order 73-3, Appendix H (codified as WAC 296-62-908), filed 5/7/73.] Repealed by 80-11-010 (Order 80-14), filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.

PART A—GENERAL

WAC 296-62-005 Occupational health and environmental control—Foreword. (1) Foreword.

(a) Modern industry is changing at an ever-increasing pace. New inventions, discoveries and developments cause changes in every facet of the industrial process. In keeping with this changing technology is the necessity to provide an adequate guide for the protection of working men and women. This chapter is for the guidance of both labor and management and to call particular attention to the way in which modernization and updating of the standards can be accomplished.

(b) This chapter is intended to cover as fully as is practical the environment in which work is performed. In addition

to the suggestions made herein, the services of modern occupational medicine must also be considered. Occupational medicine with its specialized techniques for examination, diagnosis, and treatment adds another protection for the worker as he encounters newly-developed materials and methods.

(c) With the full realization that close cooperation between government and industry, labor and management, and all the health sciences, is essential, this chapter is promulgated for the health of all the workmen coming under the jurisdiction of the department of labor and industries.

(d) This chapter is promulgated in accordance with the applicable requirements as outlined in the Washington State Administrative Procedure Act (chapter 34.04 RCW) and other applicable statutes.

[Order 73-3, § 296-62-005, filed 5/7/73; Order 70-8, § 296-62-005, filed 7/31/70, effective 9/1/70.]

WAC 296-62-010 Purpose and scope. (1) Purpose.

The purpose of this chapter is:

(a) To protect the health of workmen by prescribing minimum requirements for the prevention or control of conditions in industry hazardous to health.

(b) Assist in the provision of a healthful working environment.

(2) Scope. This chapter shall apply to all industry coming under the jurisdiction of the department of labor and industries.

[Order 73-3, § 296-62-010, filed 5/7/73; Order 70-8, § 296-62-010, filed 7/31/70, effective 9/1/70; Section I, effective 8/1/63.]

WAC 296-62-020 Definitions applicable to all sections of this chapter. Unless the context indicates otherwise, words used in this chapter shall have the meaning given in this section.

(1) "Adequate" or "effective" means compliance with terms and intent of these standards.

(2) "Appendix" means references or recommendations to be used as guides in applying the provisions of this chapter.

(3) "Approved" means approved by the director of the department of labor and industries or his authorized representative: Provided, however, That should a provision of this chapter state that approval by an agency or organization other than the department of labor and industries is required, such as Underwriters' Laboratories or the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health, the provision of WAC 296-24-006 shall apply.

(4) "Authorized person" means a person approved or assigned by the employer to perform a specific type of duty or duties or to be at a specific location or locations at the job site.

(5) "Coal tar pitch volatiles" as used in WAC 296-62-07515, Table I, include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum, (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the "coal tar pitch volatiles" standard.

(6) "Competent person" means one who is capable of identifying existing and predictable hazards in the surround-

ings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective action to eliminate them.

(7) "Department" means the department of labor and industries.

(8) "Director" means the director of the department of labor and industries, or his designated representative.

(9) "Employer" means any person, firm, corporation, partnership, business trust, legal representative, or other business entity which engages in any business, industry, profession, or activity in this state and employs one or more employees or who contracts with one or more persons, the essence of which is the personal labor of such person or persons and includes the state, counties, cities, and all municipal corporations, public corporations, political subdivisions of the state[,] and charitable organizations: Provided, That any persons, partnership, or business entity not having employees, and who is covered by the industrial insurance act shall be considered both an employer and an employee.

(10) "Hazard" means that condition, potential or inherent, which can cause injury, death, or occupational disease.

(11) "Occupational disease" means such disease or infection as arises naturally and proximately out of employment.

(12) "Qualified" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated ability to solve or resolve problems relating to the subject matter, the work, or the project.

(13) "Shall" or "must" means mandatory.

(14) "Should" or "may" means recommended.

(15) "Suitable" means that which fits, or has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstance.

(16) "Worker," "personnel," "person," "employee," and other terms of like meaning, unless the context of the provision containing such term indicates otherwise, mean an employee of an employer who is employed in the business of their employer whether by way of manual labor or otherwise and every person in this state who is engaged in the employment of or who is working under an independent contract the essence of which is their personal labor for an employer whether by manual labor or otherwise.

(17) "Work place" means any plant, yard, premises, room, or other place where an employee or employees are employed for the performance of labor or service over which the employer has the right of access or control[,] and includes, but is not limited to, all work places covered by industrial insurance under Title 51 RCW, as now or hereafter amended.

(18) Abbreviations used in this chapter:

(a) "ANSI" means American National Standards Institute.

(b) "ASHRE" means American Society of Heating and Refrigeration Engineers.

(c) "BTU" means British thermal unit.

(d) "BTUH" means British thermal unit per hour.

(e) "CFM" means cubic feet per minute.

(f) "CFR" means Code of Federal Register.

(g) "CGA" means Compressed Gas Association.

(h) "ID" means inside diameter.

(i) "MCA" means Manufacturing Chemist Association or Chemical Manufacturer Association (CMA).

(j) "NEMA" means National Electrical Manufacturing Association.

(k) "NFPA" means National Fire Protection Association.

(l) "OD" means outside diameter.

(m) "WAC" means Washington Administrative Code.

(n) "WISHA" means Washington Industrial Safety and Health Act (chapter 80, Laws of 1973).

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-020, filed 7/20/94, effective 9/20/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-020, filed 11/30/83. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 43.22 and 42.30 RCW. 80-17-015 (Order 80-21), § 296-62-020, filed 11/13/80; Order 73-3, § 296-62-020, filed 5/7/73; Order 70-8, § 296-62-020, filed 7/31/70, effective 9/1/70; Section II, effective 8/1/63.]

Reviser's note: RCW 34.05.395 requires the use of underlining and deletion marks to indicate amendments to existing rules, and deems ineffectual changes not filed by the agency in this manner. The bracketed material in the above section does not appear to conform to the statutory requirement.

WAC 296-62-040 Unconstitutionality clause. In the event that any section, paragraph, sentence, clause, phrase or work of this chapter is declared unconstitutional or invalid for any reason the remainder of said standard or this chapter shall not be affected thereby.

[Order 73-3, § 296-62-040, filed 5/7/73; Order 70-8, § 296-62-040, filed 7/31/70, effective 9/1/70; Rule 4.010, effective 8/1/63.]

WAC 296-62-050 Application for waiver or variances. See WAC 296-24-010 Variance and procedure.

[Order 73-3, § 296-62-050, filed 5/7/73; Order 70-8, § 296-62-050, filed 7/31/70, effective 9/1/70; Rule 5.010, effective 8/1/63.]

WAC 296-62-051 Ergonomics.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-051, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05105 What is a "caution zone job"?

"Caution zone"

A "caution zone job" is a job where an employee's typical work activities include any of the specific physical risk factors listed below. Typical work activities are those that are a regular and foreseeable part of the job and occur on more than one day per week, and more frequently than one week per year.

- Employers having one or more "caution zone jobs" must comply with Part 2 of this rule. "Caution zone jobs" may not be hazardous, but do require further evaluation.
- This rule does not prohibit "caution zone jobs."
- Employers who have made a reasonable determination that they do not have "caution zone jobs" are not covered by this rule.
- Duration (for example, 2 hours) refers to the total amount of time per day employees are exposed to the risk factor, not how long they spend performing the work activity that includes the risk factor.

Awkward Posture

- (1) Working with the hand(s) above the head, or the elbow(s) above the shoulder, more than 2 hours total per day
- (2) Working with the neck or back bent more than 30 degrees (without support and without the ability to vary posture) more than 2 hours total per day
- (3) Squatting more than 2 hours total per day
- (4) Kneeling more than 2 hours total per day

PART 1

WAC 296-62-05101 What is the purpose of this rule?

The purpose of this rule is to reduce employee exposure to specific workplace hazards that can cause or aggravate work-related musculoskeletal disorders (WMSDs). In workplaces where these hazards exist, employers must reduce them. Doing so will prevent WMSDs such as tendinitis, carpal tunnel syndrome and low back disorders. The rule is not designed to prevent injuries from slips, trips, falls, motor vehicle accidents or being struck by or caught in objects.

This rule contains three parts.

- Part 1, WAC 296-62-05105, provides a quick way for employers to know if they are covered.
- Part 2 requires covered employers to meet an employee-education requirement and identify WMSD hazards. If hazards exist, the employer must reduce them.
- Part 3 shows covered employers when they must comply with this rule. An employer's type of business and number of employees determine how much time is permitted for compliance (3 to 6 years for fixing WMSD hazards).

The rule does not include any requirements for the medical management of WMSDs or change any requirements for handling industrial insurance claims. An employer will not be in violation of this rule solely because an employee develops a WMSD or related symptom.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05101, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05103 Which employers are covered by this rule? Employers with "caution zone jobs" are covered by this rule. A "caution zone job" is a job where an employee's typical work activities include any of the specific physical risk factors listed in WAC 296-62-05105.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05103, filed 5/26/00, effective 7/1/02.]

High Hand Force

- (5) Pinching an unsupported object(s) weighing 2 or more pounds per hand, or pinching with a force of 4 or more pounds per hand, more than 2 hours total per day (comparable to pinching half a ream of paper)
- (6) Gripping an unsupported object(s) weighing 10 or more pounds per hand, or gripping with a force of 10 or more pounds per hand, more than 2 hours total per day (comparable to clamping light duty automotive jumper cables onto a battery)

Highly Repetitive Motion

- (7) Repeating the same motion with the neck, shoulders, elbows, wrists, or hands (excluding keying activities) with little or no variation every few seconds more than 2 hours total per day
- (8) Performing intensive keying more than 4 hours total per day

Repeated Impact

- (9) Using the hand (heel/base of palm) or knee as a hammer more than 10 times per hour more than 2 hours total per day

Heavy, Frequent or Awkward Lifting

- (10) Lifting objects weighing more than 75 pounds once per day or more than 55 pounds more than 10 times per day
- (11) Lifting objects weighing more than 10 pounds if done more than twice per minute more than 2 hours total per day
- (12) Lifting objects weighing more than 25 pounds above the shoulders, below the knees or at arms length more than 25 times per day

Moderate to High Hand-Arm Vibration

- (13) Using impact wrenches, carpet strippers, chain saws, percussive tools (jack hammers, scalers, riveting or chipping hammers) or other hand tools that typically have high vibration levels more than 30 minutes total per day
- (14) Using grinders, sanders, jig saws or other hand tools that typically have moderate vibration levels more than 2 hours total per day (Employers may assume that hand tools vibrating less than 2.5 meters per second squared (m/s²) eight-hour equivalent are not covered.)

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05105, filed 5/26/00, effective 7/1/02.]

PART 2

WAC 296-62-05110 When do employers' existing ergonomics activities comply with this rule? Employers may continue to use effective alternative methods established before this rule's adoption date. If used, the employer must be able to demonstrate that the alternative methods, taken as a whole, are as effective as the requirements of this rule in reducing the WMSD hazards of each job and providing for employee education, training and participation.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05110, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05120 Which employees must receive ergonomics awareness education and when? (1) Employers must ensure that all employees working in or supervising "caution zone jobs" receive ergonomics awareness education at least once every three years. The employer may provide ergonomics awareness education or may rely on education provided by another employer or organization. Ergonomics awareness education materials provided by the department of labor and industries may be used to meet these requirements.

(2) When employees are assigned to work in or supervise "caution zone jobs," they must receive ergonomics awareness education within 30 calendar days, unless they have received it in the past three years. This requirement applies when the

initial "awareness education" deadline in the implementation schedule (WAC 296-62-05160) has passed.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05120, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05122 What must be included in ergonomics awareness education? Ergonomics awareness education (for example: Oral presentations, videos, computer-based presentations, or written materials with discussion) must include:

- Information on work-related causes of musculoskeletal disorders, including all caution zone risk factors listed in WAC 296-62-05105 (nonwork factors may be included as well);

- The types, symptoms and consequences of WMSDs and the importance of early reporting;

- Information on identifying WMSD hazards and common measures to reduce them; and

- The requirements of this ergonomics rule.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05122, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05130 What options do employers have for analyzing and reducing WMSD hazards? All covered employers must determine whether "caution zone jobs" have WMSD hazards and must reduce the WMSD hazards identi-

fied as described below. **Employers may choose either the general performance approach or the specific performance approach as follows:**

WAC 296-62-05130 - Analyzing and reducing WMSD hazards:

General Performance Approach

- (1) The employer must analyze "caution zone jobs" to identify those with WMSD hazards that must be reduced. A WMSD hazard is a physical risk factor that by itself or in combination with other physical risk factors has a sufficient level of intensity, duration or frequency to cause a substantial risk of WMSDs. The employer must use hazard control levels as effective as the recommended levels in widely used methods such as the Job Strain Index, the lifting guidelines in the Department of Energy ErgoEASER, the ANSI S3.34-1986 (R1997) Hand Arm Vibration Standards, the 1991 NIOSH Lifting Equation, (as described in Waters 1993), the UAW-GM Risk Factor Checklists, applicable ACGIH threshold limit values for physical agents, Rapid Entire Body Assessment (REBA), or Rapid Upper Limb Assessment (RULA).
- (2) The employer must analyze "caution zone jobs" using a systematic method that includes the following, if applicable:
 - Physical demands specific to the worksite including posture, force, repetition, repeated impacts, hand-arm vibration, duration, work pace, task variability and recovery time;
 - Layout of the work area, including reaches, working heights, seating and surfaces; and
 - Manual handling requirements, including size, shape, weight, and packaging.
- (3) Individuals responsible for hazard analysis must know how to use the analysis method effectively and be informed about the requirements of this rule.
- (4) The employer must reduce all WMSD hazards below the criteria chosen in WAC 296-62-05130(1) or to the degree technologically and economically feasible.
- (5) Employers must reduce WMSD hazards as described below by:
 - (a) Implementing controls that do not rely primarily on employee behavior to reduce WMSD hazards, such as the following:
 - Changes to workstations and tools
 - Reducing the size and weights of loads handled
 - Process redesign to eliminate unnecessary steps or introduce task variety
 - Job rotation
 - (b) If employers cannot reduce WMSD hazards below the hazard level using the controls identified above, they must supplement those controls with interim measures that primarily rely on individual work practices or personal protective equipment. Examples of such practices include the following:
 - Impact gloves

WAC 296-62-05130 - Analyzing and reducing WMSD hazards:

Specific Performance Approach

- (1) The employer must analyze "caution zone jobs" to identify those with WMSD hazards that must be reduced. A WMSD hazard is a physical risk factor that exceeds the criteria in Appendix B of this rule.
- (2) Same as General Performance Approach.
- (3) Individuals responsible for hazard analysis must know how to use the analysis provided in Appendix B effectively and be informed about the requirements of this rule.
- (4) The employer must reduce all WMSD hazards below the criteria in Appendix B of this rule or to the degree technologically and economically feasible.
- (5) Same as General Performance Approach.

WAC 296-62-05130 - Analyzing and reducing WMSD hazards:

General Performance Approach

- Team lifting
 - Training on work techniques
- (c) This rule does not require an employer to control WMSD hazards by replacing full-time employees with part-time employees or otherwise reducing an individual's hours of employment. If an employer has implemented all other technologically and economically feasible controls, and a WMSD hazard remains, the employer will be deemed in compliance with this subsection.
- (6) If measures to reduce WMSD hazards include changes in the job or work practices then job-specific training must be provided. This job-specific training must include:
- The hazards of the work activities;
 - Safe work practices; and
 - The proper use and maintenance of specific measures to reduce WMSD hazards that have been implemented.
- (7) No written ergonomics program is required. The employer must be able to demonstrate the following:
- The method used to analyze "caution zone jobs";
 - The criteria used to identify WMSD hazards;
 - The jobs with identified WMSD hazards; and
 - The reduction of all WMSD hazards below the criteria chosen in WAC 296-62-05130(1) or to the degree technologically and economically feasible.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05130, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05140 How must employees be kept involved and informed? (1) The employer must provide for and encourage employee participation in analyzing "caution zone jobs" and selecting measures to reduce WMSD hazards. Employers with eleven or more employees who are required to have safety committees (WAC 296-24-045), must involve this committee in choosing the methods to be used for employee participation.

(2) Employers with eleven or more employees must share the following information with the safety committee (if a committee is required by WAC 296-24-045). Employers who are not required to have a safety committee (WAC 296-24-045) must provide this information at safety meetings:

- The requirements of this rule;
- Identified "caution zone jobs";
- Results of the hazard analysis and/or identification of jobs with WMSD hazards; and
- Measures to reduce WMSD hazards.

(3) The employer must review its ergonomics activities at least annually for effectiveness and for any needed improvements. This review must include members of the safety committee where one exists or ensure an equally effective means of employee involvement.

(2001 Ed.)

WAC 296-62-05130 - Analyzing and reducing WMSD hazards:

Specific Performance Approach

- (6) Same as General Performance Approach.
- (7) No written ergonomics program is required. The employer must be able to demonstrate that all WMSD hazards have been reduced below the criteria identified in Appendix B of this rule or to the degree technologically and economically feasible.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05140, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05150 How are terms and phrases used in this rule? Note: Check L&I's WISHA Services web site at <http://www.lni.wa.gov/wisha/ergo> for current links to any of the web sites referred to in this section.

ACGIH threshold limit values for physical hazards - The American Conference of Governmental Industrial Hygienists, Thresholds Limit Values for Chemical Substances and Physical Agents in the Work Environment, and Biological Exposure Indices (TLVs and BEIs). Available for purchase at the ACGIH web site at <http://www.acgih.org>.

ANSI S3.34-1986 (R1997) Hand Arm Vibration Standards - American National Standard Guide for the Measurement and Evaluation of Human Exposure to Vibration Transmitted to the Hand. ANSI S3.34-1986 (R1997). Available for purchase at the ANSI web site at <http://web.ansi.org/default.htm>.

"Caution zone jobs" - Jobs where an employee's typical work activities include any of the specific physical risk factors identified in WAC 296-62-05105. These jobs have a sufficient degree of risk to require ergonomics awareness education and job hazard analysis.

[Title 296 WAC—p. 1381]

Department of Energy ErgoEASER - Ergonomics Education, Awareness, System Evaluation and Recording (ErgoEASER) software package. U.S. Department of Energy, Office of Environment, Safety, and Health (1995). Can be downloaded from the Department of Energy web site at <http://tis.eh.doe.gov/others/ergoeaser/download.htm>.

Ergonomics - The science and practice of designing jobs or workplaces to match the capabilities and limitations of the human body.

Full Time Equivalent (FTE) - The equivalent of one person working full-time for one year (2,000 worker hours per year). For example, two persons working half time count as one FTE.

High Hand-Arm Vibration Levels - Tools with vibration values equal to or greater than 10 meters per second squared (m/s^2) eight-hour equivalent. Examples include some impact wrenches, carpet strippers, chain saws, and percussive tools.

Intensive Keying - Keying with the hands or fingers in a rapid, steady motion with few opportunities for temporary work pauses.

Job Strain Index - The Strain Index: A proposed method to analyze jobs for risk of distal upper extremity disorders, Moore, J.S., and A. Garg, (1995). Published in American Industrial Hygiene Association Journal, volume 56, pages 443-458. Web site at <http://sg-www.satx.disa.mil/hscemo/tools/strain.htm>.

Moderate Hand-Arm Vibration Levels - Tools with vibration values between 2.5 and 10 meters per second squared (m/s^2) eight-hour equivalent. Examples include some grinders, sanders, and jig saws.

NIOSH Lifting Equation, 1991 - Waters, T.R., Putz-Anderson, V., Garg, A., and Fine, L.J. (1993). Revised NIOSH equation for the design and evaluation of manual lifting tasks. Published in Ergonomics, volume 36 (7), pages 749-776. For a manual on using the lifting equation see: Applications Manual for Revised Lifting Equation, Waters, T., Putz-Anderson, V., Garg, A., (1994). Available from the National Technical Information Center (NTIS), Springfield, VA 22161. 1-800-553-6847. Calculator web site at

<http://www.industrialhygiene.com/calc/lift.html>. Application guideline web site at <http://www.cdc.gov/niosh/94-110.html>.

Rapid Entire Body Assessment tool (REBA) - Hignett, S. and McAtamney, L. (2000) Rapid entire body assessment (REBA). Published in Applied Ergonomics, volume 31, pages 201-205.

Recovery Time - Work periods with light task demands, or rest breaks, that permit an employee to recover from physically demanding work.

The Rapid Upper Limb Assessment (RULA) - McAtamney, L. and Corlett, E.N. (1993) RULA: A survey method for the investigation of work-related upper limb disorders. Published in Applied Ergonomics, volume 24 (2), pages 91-99.

UAW-GM Risk Factor Checklists - UAW-GM Risk Factor Checklist 2, 1998. UAW-GM (United Auto Workers-General Motors) Center for Human Resources, Health and Safety Center, 1030 Doris Road, Auburn Hills, Michigan.

Work Activities - The physical demands, exertions, or functions of the job or task.

Work-Related Musculoskeletal Disorders (WMSDs) - Work-related disorders that involve soft tissues such as muscles, tendons, ligaments, joints, blood vessels and nerves. Examples include: Muscle strains and tears, ligament sprains, joint and tendon inflammation, pinched nerves, degeneration of spinal discs, carpal tunnel syndrome, tendinitis, rotator cuff syndrome. For purposes of this rule WMSDs do not include injuries from slips, trips, falls, motor vehicle accidents or being struck by or caught in objects.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05150, filed 5/26/00, effective 7/1/02.]

PART 3

WAC 296-62-05160 When must employers comply with this rule? Employers covered by this rule must comply with its requirements by the dates shown.

Employer	INITIAL IMPLEMENTATION SCHEDULE Awareness Education Completed And Hazard Analysis Completed	Hazard Reduction Completed
<ul style="list-style-type: none"> All employers in SIC codes* 078, 152, 174, 175, 176, 177, 242, 421, 451, 541, 805, and 836 who employ 50 or more annual full time equivalents (FTEs) in Washington state The Washington State Department of Labor & Industries 	July 1, 2002	July 1, 2003
<ul style="list-style-type: none"> The remaining employers in SIC codes* 078, 152, 174, 175, 176, 177, 242, 421, 451, 541, 805 and 836 All other employers who employ 50 or more annual full time equivalents (FTEs) in Washington state 	July 1, 2003	July 1, 2004

All other employers employing 11-49 annual full time equivalents (FTEs) in Washington state.	July 1, 2004	July 1, 2005
All other employers employing 10 or fewer annual full time equivalents (FTEs) in Washington state.	July 1, 2005	July 1, 2006

SUPPLEMENTAL IMPLEMENTATION SCHEDULE

New workplaces or businesses	One year from the date the new workplace or business is established	15 months from the date the new workplace or business is established
	OR	
Significant changes to existing workplaces or businesses	According to the schedule above	According to the schedule above
	2 months after significant changes occur	3 months after significant changes occur
OR		OR
According to the schedule above		According to the schedule above

* Note: SIC code is the employer's primary SIC based on hours of employment. See Appendix C of this rule for descriptions of these SIC codes.

pictures aid their understanding of the text in WAC 296-62-05105.

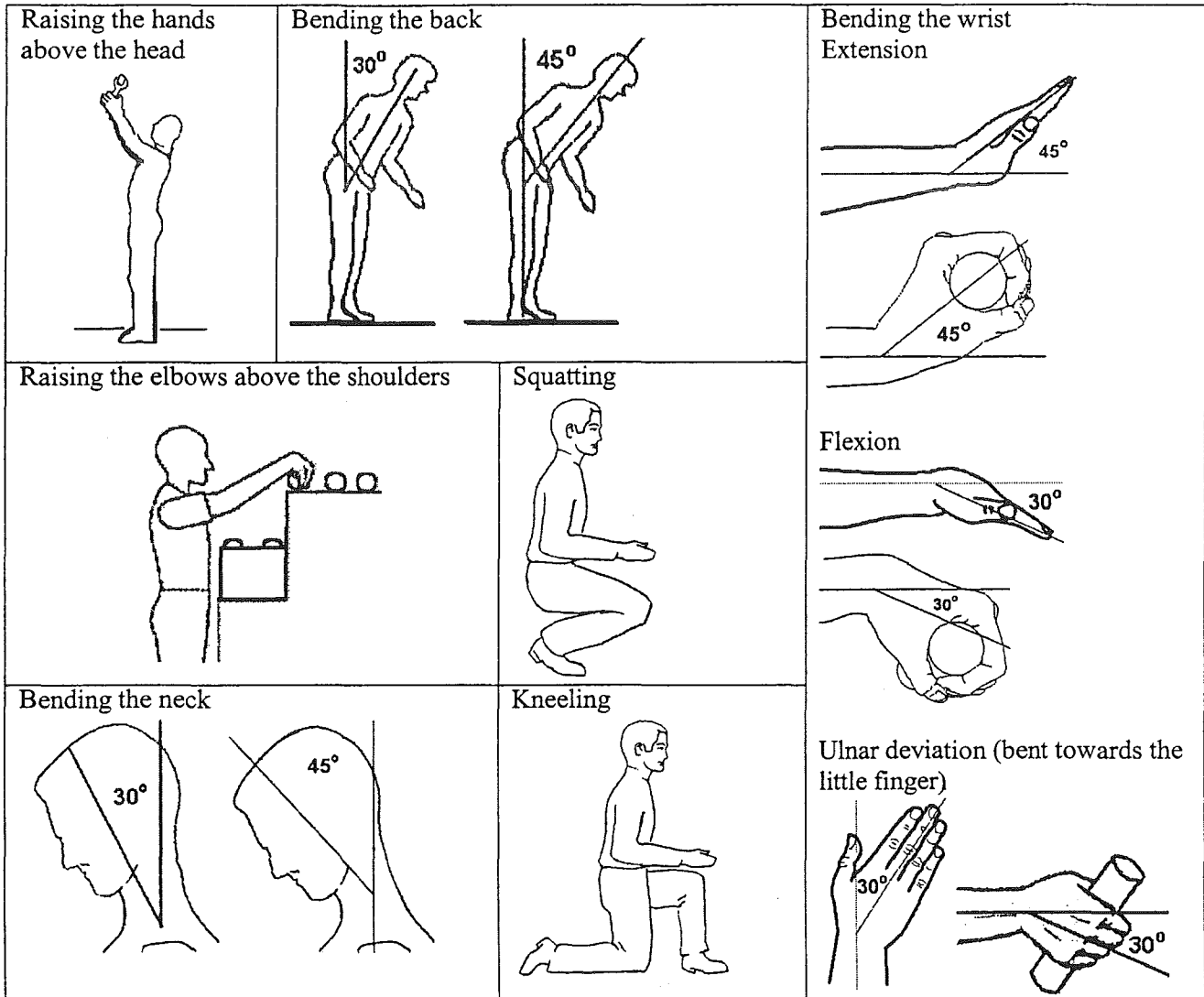
Note: Help for employers in implementing the rule.

- (1) **Developing Ergonomics Guides and Models**
The department will work with employer and employee organizations to develop guides for complying with this rule (for example, a model program for ergonomics awareness education). Employer use of these guides will be optional.
- (2) **Identifying Industry "Best Practices"**
The department will work with employer and employee organizations to develop or identify methods of reducing WMSD hazards that will serve as examples of industry-specific "best practices." As industry-specific "best practices" are developed, they may be used to demonstrate employer compliance with the requirement to reduce WMSD hazards. Employers will not be restricted to the use of industry "best practices" for compliance.
- (3) **Establishing Inspection Policies and Procedures**
The department will develop policies and procedures for inspections and enforcement of this rule before the rule is enforced. These policies and procedures will be communicated to employers and employees through mailing lists, business associations, labor unions and other methods before the department issues any citations or penalties.
- (4) **Conducting Demonstration Projects**
Following adoption of this rule, the department will work with employers and employees to undertake demonstration projects to test and improve guidelines, "best practices" and inspection policies and procedures as they are developed.
- (5) **Providing Information on Ergonomics**
The department will work with employer and employee organizations to collect and share the most effective examples of ergonomics training, job analysis, and specific solutions to problems. The department will make special efforts to share this information with the small business community.

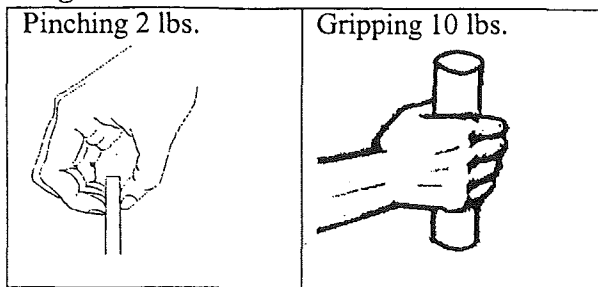
[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05160, filed 5/26/00, effective 7/1/02.]

WAC 296-62-05172 Appendix A: Illustrations of physical risk factors. The following illustrations are provided as reference only. Some users of this rule may find the

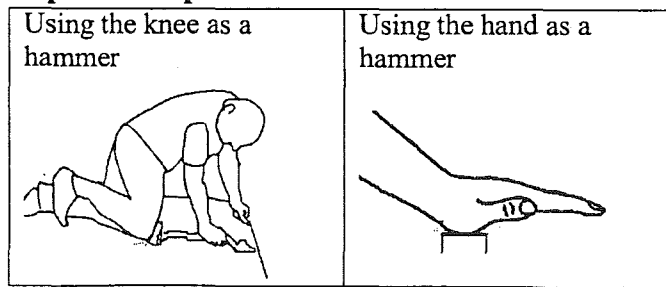
Awkward Postures



High Hand Force



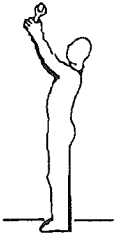
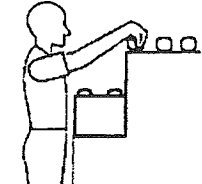
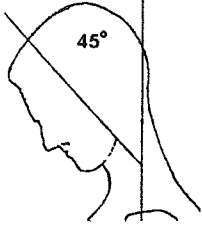
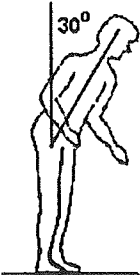
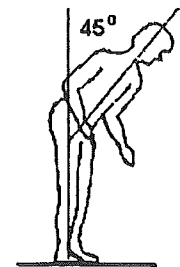
Repeated Impacts



[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05172, filed 5/26/00, effective 7/1/02.]


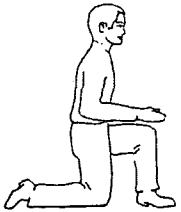
exists and must be reduced below the hazard level or to the degree technologically and economically feasible (see WAC 296-62-05130(4), specific performance approach).

WAC 296-62-05174 Appendix B: Criteria for analyzing and reducing WMSD hazards for employers who choose the specific performance approach. For each "caution zone job" find any physical risk factors that apply. Reading across the page, determine if all of the conditions are present in the work activities. If they are, a WMSD hazard

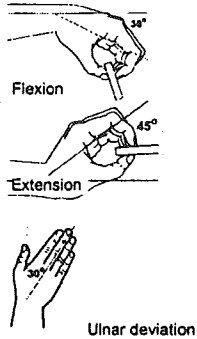
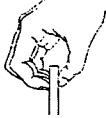
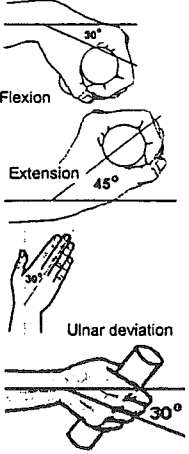
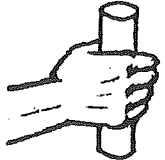
Awkward Posture			
Body Part	Physical Risk Factor	Duration	Visual Aid
Shoulders	Working with the hand(s) above the head or the elbow(s) above the shoulder(s)	More than 4 hours total per day	
	Repetitively raising the hand(s) above the head or the elbow(s) above the shoulder(s) more than once per minute	More than 4 hours total per day	
Neck	Working with the neck bent more than 45° (without support or the ability to vary posture)	More than 4 hours total per day	
Back	Working with the back bent forward more than 30° (without support, or the ability to vary posture)	More than 4 hours total per day	
	Working with the back bent forward more than 45° (without support or the ability to vary posture)	More than 2 hours total per day	

Check (✓) here if this is a WMSD hazard



Awkward Posture (continued)			
Body Part	Physical Risk Factor	Duration	Visual Aid
Knees	Squatting	More than 4 hours total per day	
	Kneeling	More than 4 hours total per day	


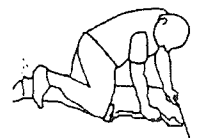
Check (✓) here if this is a WMSD hazard

High Hand Force				
Body Part	Physical Risk Factor	Combined with	Duration	Visual Aid
Arms, wrists, hands	Pinching an unsupported object(s) weighing 2 or more pounds per hand, or pinching with a force of 4 or more pounds per hand (comparable to pinching half a ream of paper)	Highly repetitive motion	More than 3 hours total per day	
		Wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more	More than 3 hours total per day	
		No other risk factors	More than 4 hours total per day	
Arms, wrists, hands	Gripping an unsupported object(s) weighing 10 or more pounds per hand, or gripping with a force of 10 pounds or more per hand (comparable to clamping light duty automotive jumper cables onto a battery)	Highly repetitive motion	More than 3 hours total per day	
		Wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more	More than 3 hours total per day	
		No other risk factors	More than 4 hours total per day	

Check (✓) here if this is a WMSD hazard

Highly Repetitive Motion			
Body Part	Physical Risk Factor	Combined with	Duration
Neck, shoulders, elbows, wrists, hands	Using the same motion with little or no variation every few seconds (excluding keying activities)	No other risk factors	More than 6 hours total per day
	Using the same motion with little or no variation every few seconds (excluding keying activities)	Wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more AND High, forceful exertions with the hand(s)	More than 2 hours total per day
	Intensive keying	Awkward posture, including wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more	More than 4 hours total per day
		No other risk factors	More than 7 hours total per day

Check (✓) here if this is a WMSD hazard

Repeated Impact			
Body Part	Physical Risk Factor	Duration	Visual Aid
Hands	Using the hand (heel/base of palm) as a hammer more than once per minute	More than 2 hours total per day	
Knees	Using the knee as a hammer more than once per minute	More than 2 hours total per day	

Check (✓) here if this is a WMSD hazard

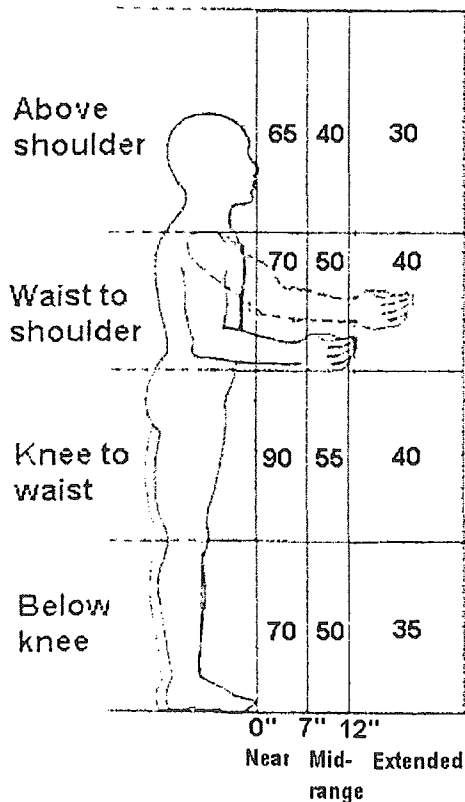
Heavy, Frequent or Awkward Lifting

This analysis only pertains if you have "caution zone jobs" where employees lift 10 lbs. or more (see WAC 296-62-05105, Heavy, Frequent, or Awkward Lifting) and you have chosen the specific performance approach.

Step 1 Find out the actual weight of objects that the employee lifts.

Actual Weight = _____ lbs.

Step 2 Determine the Unadjusted Weight Limit. Where are the employee's hands when they begin to lift or lower the object? Mark that spot on the diagram below. The number in that box is the Unadjusted Weight Limit in pounds.



Unadjusted Weight Limit: _____ lbs.

Step 3 Find the Limit Reduction Modifier. Find out how many times the employee lifts per minute and the total number of hours per day spent lifting. Use this information to look up the Limit Reduction Modifier in the table below.

How many lifts per minute?	For how many hours per day?		
	1 hr or less	1 hr to 2 hrs	2 hrs or more
1 lift every 2-5 mins.	1.0	0.95	0.85
1 lift every min	0.95	0.9	0.75
2-3 lifts every min	0.9	0.85	0.65
4-5 lifts every min	0.85	0.7	0.45
6-7 lifts every min	0.75	0.5	0.25
8-9 lifts every min	0.6	0.35	0.15
10+ lifts every min	0.3	0.2	0.0

Note: For lifting done less than once every five minutes, use 1.0

Limit Reduction Modifier: _____

Step 4 Calculate the Weight Limit. Start by copying the Unadjusted Weight Limit from Step 2.

Unadjusted Weight Limit: = _____ lbs.

If the employee twists more than 45 degrees while lifting, reduce the Unadjusted Weight Limit by multiplying by 0.85. Otherwise, use the Unadjusted Weight Limit

Twisting Adjustment: = _____

Adjusted Weight Limit: = _____ lbs.

Multiply the Adjusted Weight Limit by the Limit Reduction Modifier from Step 3 to get the Weight Limit.

Limit Reduction Modifier: _____

Weight Limit: = _____ lbs.

Step 5 Is this a hazard? Compare the Weight Limit calculated in Step 4 with the Actual Weight lifted from Step 1. If the Actual Weight lifted is greater than the Weight Limit calculated, then the lifting is a WMSD hazard and must be reduced below the hazard level or to the degree technologically and economically feasible.

Note: If the job involves lifts of objects with a number of different weights and/or from a number of different locations, use Steps 1 through 5 above to:

1. Analyze the two worst case lifts – the heaviest object lifted and the lift done in the most awkward posture.
2. Analyze the most commonly performed lift. In Step 3, use the frequency and duration for all of the lifting done in a typical workday.

Hand-Arm Vibration

Use the instructions below to determine if a hand-arm vibration hazard exists.

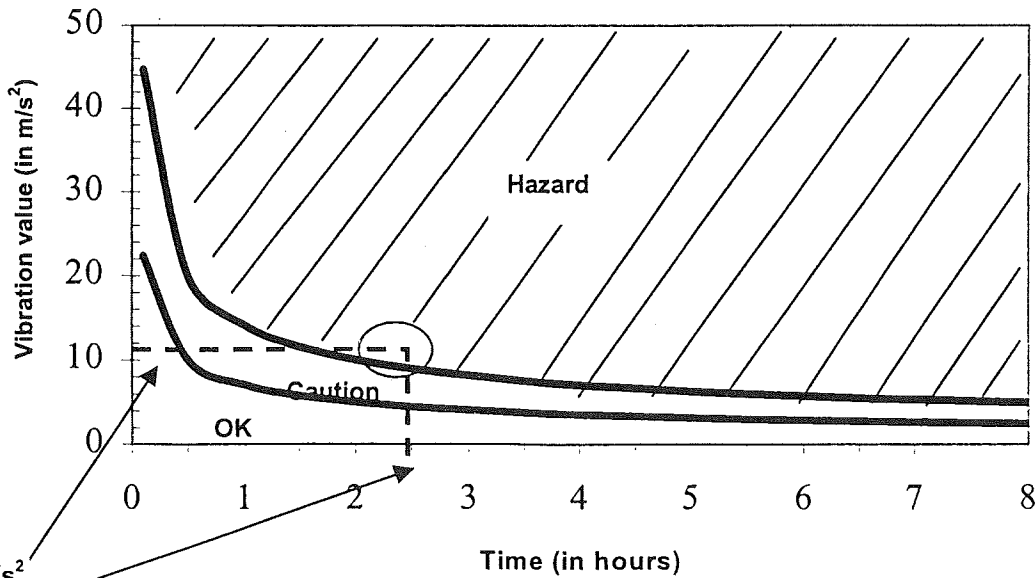
Step 1. Find the vibration value for the tool. (Get it from the manufacturer, look it up at this web site: <http://umetech.niwl.se/vibration/HAVHome.html>, or you may measure the vibration yourself). The vibration value will be in units of meters per second squared (m/s^2). On the graph below find the point on the left side that is equal to the vibration value.

Note: You can also link to this web site through the L&I WISHA Services Ergonomics web site: <http://www.lni.wa.gov/wisha/ergo>

Step 2. Find out how many total hours per day the employee is using the tool and find that point on the bottom of the graph.

Step 3. Trace a line in from each of these two points until they cross.

Step 4. If that point lies in the crosshatched "Hazard" area above the upper curve, then the vibration hazard must be reduced below the hazard level or to the degree technologically and economically feasible. If the point lies between the two curves in the "Caution" area, then the job remains as a "Caution Zone Job." If it falls in the "OK" area below the bottom curve, then no further steps are required.



Example:
An impact wrench with a vibration value of $12 m/s^2$ is used for $2\frac{1}{2}$ hours total per day. The exposure level is in the Hazard area. The vibration must be reduced below the hazard level or to the degree technologically and economically feasible.

Note: The caution limit curve (bottom) is based on an 8-hour energy-equivalent frequency-weighted acceleration value of $2.5 m/s^2$. The hazard limit curve (top) is based on an 8-hour energy-equivalent frequency-weighted acceleration value of $5 m/s^2$.

WAC 296-62-05176 Appendix C: Standard industry classification (SIC) codes. The descriptive titles for the SIC codes listed in the implementation schedule (WAC 296-62-05160) are provided below. SIC codes are established by the federal Office of Management and Budget and are listed in the *Standard Industrial Classification Manual*, 1987 edition.

SIC*	INDUSTRY	EXAMPLES
078	Landscape and Horticultural Services	<ul style="list-style-type: none"> • lawn and garden services • ornamental shrub and tree services
152	General Building Contractors, Residential Buildings	<ul style="list-style-type: none"> • general contractors single family houses • general contractors residential buildings other than single family
174	Masonry, Stonework, Tile Setting & Plastering	<ul style="list-style-type: none"> • masonry, stone setting, and other stone work • plastering, drywall, acoustical, and insulation work • terrazzo, tile, marble, and mosaic work
175	Carpentry and Floor Work	<ul style="list-style-type: none"> • carpentry work • floor laying and other floor work (NEC**)
176	Roofing, Siding and Sheet Metal	<ul style="list-style-type: none"> • installation of roofing, siding, and sheet metal work
177	Concrete Work	<ul style="list-style-type: none"> • includes portland cement and asphalt
242	Sawmills & Planing Mills	<ul style="list-style-type: none"> • sawmills and planing mills • hardwood dimension and flooring mills • special products sawmills (NEC**)
421	Trucking & Courier Service, not Air	<ul style="list-style-type: none"> • trucking • local trucking with or without storage • courier services (except by air)
451	Air Transportation, Scheduled and Air Courier	<ul style="list-style-type: none"> • scheduled air transportation • air courier services <p>Note: WISHA jurisdiction excludes planes in flight.</p>
541	Grocery Stores	<ul style="list-style-type: none"> • supermarkets • food stores • grocery stores
805	Nursing & Personal Care	<ul style="list-style-type: none"> • skilled nursing care facilities • intermediate care facilities • nursing and personal care facilities (NEC**)
836	Residential Care	<ul style="list-style-type: none"> • Establishments primarily engaged in the provision of residential social and personal care for children, the aged, and special categories of persons with some limits on ability for self-care, but where medical care is not a major element.

*SIC or NAICS equivalent. In 2000, federal agencies that produce statistical data will adopt NAICS (North American Industry Classification System) codes and begin to phase out the SIC codes. State and local government agencies also will use this new coding structure to promote a common language for categorizing today's industries.

**NEC - not elsewhere classified.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-12-024, § 296-62-05176, filed 5/26/00, effective 7/1/02.]

PART B—ACCESS TO RECORDS

WAC 296-62-052 Access to employee exposure and medical records.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-052, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-052, filed 8/27/81.]

WAC 296-62-05201 Purpose. The purpose of this section is to provide employees and their designated representatives a right of access to relevant exposure and medical records, and to provide representatives of the director of labor

and industries a right of access to these records in order to fulfill responsibilities under the Washington Industrial Safety and Health Act. Access by employees, their representatives, and the director of labor and industries is necessary to yield both direct and indirect improvements in the detection, treatment and prevention of occupational disease. Each employer is responsible for assuring compliance with this section, but the activities involved in complying with the access to medical records provisions can be carried out, on behalf of the employer, by the physician or other health care personnel in charge of employee medical records. Except as expressly provided, nothing in this section is intended to affect existing legal and ethical obligations concerning the maintenance and confidentiality of employee medical information, the duty to disclose information to a patient/employee or any other aspect of the medical-care relationship, or affect existing legal obligations concerning the protection of trade secret information.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05201, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05201, filed 8/27/81.]

WAC 296-62-05203 Scope and application. (1) This section applies to every employer, except as provided in subsection (4) of this section, who makes, maintains, contracts for, or has access to employee exposure or medical records, or analyses thereof, pertaining to employees exposed to toxic substances or harmful physical agents.

(2) This section applies to all employee exposure and medical records, and analyses thereof, of such employees, whether or not the records are mandated by specific occupational safety and health standards.

(3) This section applies to all employee exposure and medical records, and analyses thereof, made or maintained in any manner, including on an in-house or contractual (e.g., fee-for-service) basis. Each employer shall assure that the preservation and access requirements of this section are complied with regardless of the manner in which records are made or maintained.

(4) This section does not apply to the agricultural operations covered by chapter 296-306 WAC.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05203, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05203, filed 8/27/81.]

WAC 296-62-05205 Definitions. (1) Access - the right and opportunity to examine and copy.

(2) Analysis using exposure or medical records - any compilation of data, or any statistical study based at least in part on information collected from individual employee exposure or medical records or information collected from health insurance claims records, provided that either the analysis has been reported to the employer or no further work is currently being done by the person responsible for preparing the analysis.

(3) Designated representative - any individual or organization to whom an employee gives written authorization to exercise a right of access. For the purposes of access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

(4) Employee - a current employee, a former employee, or an employee being assigned or transferred to work where there will be exposure to toxic substances or harmful physical agents. In the case of a deceased or legally incapacitated employee, the employee's legal representative may directly exercise all the employee's rights under this section.

(5) Employee exposure record - a record containing any of the following kinds of information:

(a) Environmental (workplace) monitoring or measuring of a toxic substance or harmful physical agent, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;

(b) Biological monitoring results which directly assess the absorption of a toxic substance or harmful physical agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.) but not including results

which assess the biological effect of a substance or agent or which assess an employee's use of alcohol or drugs;

(c) Material safety data sheets indicating that the material may pose a hazard to human health; or

(d) In the absence of the above, a chemical inventory or any other record which reveals where and when used and the identity (e.g., chemical, common or trade name) of a toxic substance or harmful physical agent.

(6)(a) Employee medical record - a record concerning the health status of an employee which is made or maintained by a physician, nurse, or other health care personnel, or technician, including:

(i) Medical and employment questionnaires or histories (including job description and occupational exposures);

(ii) The results of medical examinations (preemployment, pre-assignment, periodic, or episodic) and laboratory tests (including chest and other x-ray examinations taken for purposes of establishing a base-line or detecting occupational illness, and all biological monitoring not defined as an "employee exposure record");

(iii) Medical opinions, diagnoses, progress notes, and recommendations;

(iv) First-aid records;

(v) Descriptions of treatments and prescriptions; and

(vi) Employee medical complaints.

(b) Employee medical record does not include medical information in the form of:

(i) Physical specimens (e.g., blood or urine samples) which are routinely discarded as a part of normal medical practice; or

(ii) Records concerning health insurance claims if maintained separately from the employer's medical program and its records, and not accessible to the employer by employee name or other direct personal identifier (e.g., Social Security number, payroll number, etc.); or

(iii) Records created solely in preparation for litigation which are privileged from discovery under applicable rules or procedure or evidence; or

(iv) Records concerning voluntary employee assistance programs (alcohol, drug abuse, or personal counseling programs) if maintained separately from the employer's medical program and its records.

(7) Employer - a current employer, a former employer or a successor employer.

(8) Exposure or exposed - an employee is subjected to a toxic substance or harmful physical agent in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes past exposure and potential (e.g., accidental or possible) exposure, but does not include situations where the employer can demonstrate that the toxic substance or harmful physical agent is not used, handled, stored, generated, or present in the workplace in any manner different from typical nonoccupational situations.

(9) Health professional - a physician, occupational health nurse, industrial hygienist, toxicologist, or epidemiologist, providing medical or other occupational health services to exposed employees.

(10) Record - any item, collection, or grouping of information regardless of the form or process by which it is main-

tained (e.g., paper document, microfiche, microfilm, x-ray film, or automated data processing).

(11) Specific chemical identity - the chemical name, chemical abstracts service (CAS) registry number, or any other information that reveals the precise chemical designation of the substance.

(12)(a) Specific written consent - a written authorization containing the following:

(i) The name and signature of the employee authorizing the release of medical information;

(ii) The date of the written authorization;

(iii) The name of the individual or organization that is authorized to release the medical information;

(iv) The name of the designated representative (individual or organization) that is authorized to receive the released information;

(v) A general description of the medical information that is authorized to be released;

(vi) A general description of the purpose for the release of the medical information; and

(vii) A date or condition upon which the written authorization will expire (if less than one year).

(b) A written authorization does not operate to authorize the release of medical information not in existence on the date of written authorization, unless the release of future information is expressly authorized, and does not operate for more than one year from the date of written authorization.

(c) A written authorization may be revoked in writing prospectively at any time.

(13) Toxic substance or harmful physical agent - any chemical substance, biological agent (bacteria, virus, fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and nonionizing radiation, hypo- or hyperbaric pressure, etc.) which:

(a) Is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) (See Appendix B); or

(b) Has yielded positive evidence of an acute or chronic health hazard in testing conducted by, or known to, the employer; or

(c) Is the subject of a material safety data sheet kept by or known to the employer indicating that the material may pose a hazard to human health.

(14) Trade secret - any confidential formula, pattern, process, device, or information or compilation of information that is used in an employer's business and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05205, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05205, filed 8/27/81.]

WAC 296-62-05207 Preservation of records. (1) Unless a specific occupational safety and health standard provides a different period of time, each employer shall assure the preservation and retention of records as follows:

(a) Employee medical records. The medical record for each employee shall be preserved and maintained for at least

the duration of employment plus thirty years, except that the following types of records need not be retained for any specific period:

(i) Health insurance claims records maintained separately from the employer's medical program and its records;

(ii) First-aid records (not including medical histories) of one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and the like which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job, if made on-site by a nonphysician and if maintained separately from the employer's medical program and its records; and

(iii) The medical records of employees who have worked for less than one year for the employer need not be retained beyond the term of employment if they are provided to the employee upon the termination of employment.

(b) Employee exposure records. Each employee exposure record shall be preserved and maintained for at least thirty years, except that:

(i) Background data to environmental (workplace) monitoring or measuring, such as laboratory reports and worksheets, need only be retained for one year as long as the sampling results, the collection methodology (sampling plan), a description of the analytical and mathematical methods used, and a summary of other background data relevant to interpretation of the results obtained, are retained for at least thirty years; and

(ii) Material safety data sheets and WAC 296-62-05205(5) records concerning the identity of a substance or agent need not be retained for any specified period as long as some record of the identity (chemical name if known) of the substance or agent, where it was used, and when it was used is retained for at least thirty years; and

(iii) Biological monitoring results designated as exposure records by specific occupational safety and health standards shall be preserved and maintained as required by the specific standard.

(c) Analyses using exposure or medical records. Each analysis using exposure or medical records shall be preserved and maintained for at least thirty years.

(2) Nothing in this section is intended to mandate the form, manner, or process by which an employer preserves a record as long as the information contained in the record is preserved and retrievable, except that chest x-ray films shall be preserved in their original state.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05207, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05207, filed 8/27/81.]

WAC 296-62-05209 Access to records. (1) General.

(a) Whenever an employee or designated representative requests access to a record, the employer shall assure that access is provided in a reasonable time, place, and manner. If the employer cannot reasonably provide access to the record within fifteen working days, the employer shall within fifteen working days apprise the employee or designated representative requesting the record of the reason for the delay and the earliest date when the record can be made available.

(b) The employer may require of the requester only such information as should be readily known to the requester and which may be necessary to locate or identify the records being requested (e.g., dates and locations where the employee worked during the time period in question).

(c) Whenever an employee or designated representative requests a copy of a record, the employer shall assure that either:

(i) A copy of the record is provided without cost to the employee or representative;

(ii) The necessary mechanical copying facilities (e.g., photocopying) are made available without cost to the employee or representative for copying the record;

(iii) The record is loaned to the employee or representative for a reasonable time to enable a copy to be made; or

(iv) In the case of an original x-ray, the employer may restrict access to on-site examination or make other suitable arrangements for the temporary loan of the x-ray.

(d) Whenever a record has been previously provided without cost to an employee or designated representative, the employer may charge reasonable, nondiscriminatory administrative costs (i.e., search and copying expenses but not including overhead expenses) for a request by the employee or designated representative for additional copies of the record, except that:

(i) An employer shall not charge for an initial request for a copy of new information that has been added to a record which was previously provided; and

(ii) An employer shall not charge for an initial request by a recognized or certified collective bargaining agent for a copy of an employee exposure record or an analysis using exposure or medical records.

(e) Nothing in this section is intended to preclude employees and collective bargaining agents from collectively bargaining to obtain access to information in addition to that available under this section.

(2) Employee and designated representative access.

(a) Employee exposure records. Except as limited by WAC 296-62-05211, each employer shall, upon request, assure the access of each employee and designated representative to employee exposure records relevant to the employee. For the purpose of this section, an exposure record relevant to the employee consists of:

(i) A record which measures or monitors the amount of a toxic substance or harmful physical agent to which the employee is or has been exposed;

(ii) In the absence of such directly relevant records, such records of other employees with past or present job duties or working conditions related to or similar to those of the employee to the extent necessary to reasonably indicate the amount and nature of the toxic substances or harmful physical agents to which the employee is or has been subjected; and

(iii) Exposure records to the extent necessary to reasonably indicate the amount and nature of the toxic substances or harmful physical agents at workplaces or under working conditions to which the employee is being assigned or transferred.

(iv) Requests by designated representatives for unconsented access to employee exposure records shall be in writing and shall specify with reasonable particularity:

(A) The records requested to be disclosed; and

(B) The occupational health need for gaining access to these records.

(b) Employee medical records.

(i) Each employer shall, upon request, assure the access of each employee to employee medical records of which the employee is the subject, except as provided in (b)(iv) of this subsection.

(ii) Each employer shall, upon request, assure the access of each designated representative to the employee medical records of any employee who has given the designated representative specific written consent. Appendix A to this section contains a sample form which may be used to establish specific written consent for access to employee medical records.

(iii) Whenever access to employee medical records is requested, a physician representing the employer may recommend that the employee or designated representative:

(A) Consult with the physician for the purposes of reviewing and discussing the records requested;

(B) Accept a summary of material facts and opinions in lieu of the records requested; or

(C) Accept release of the requested records only to a physician or other designated representative.

(iv) Whenever an employee requests access to his or her employee medical records, and a physician representing the employer believes that direct employee access to information contained in the records regarding a specific diagnosis of a terminal illness or a psychiatric condition could be detrimental to the employee's health, the employer may inform the employee that access will only be provided to a designated representative of the employee having specific written consent, and deny the employee's request for direct access to this information only. Where a designated representative with specific written consent requests access to information so withheld, the employer shall assure the access of the designated representative to this information, even when it is known that the designated representative will give the information to the employee.

(v) A physician, nurse, or other responsible health care personnel maintaining employee medical records may delete from requested medical records the identity of a family member, personal friend, or fellow employee who has provided confidential information concerning an employee's health status.

(c) Analyses using exposure or medical records.

(i) Each employer shall, upon request, assure the access of each employee and designated representative to each analysis using exposure or medical records concerning the employee's working conditions or workplace.

(ii) Whenever access is requested to an analysis which reports the contents of employee medical records by either direct identifier (name, address, social security number, payroll number, etc.) or by information which could reasonably be used under the circumstances indirectly to identify specific employees (exact age, height, weight, race, sex, date of initial employment, job title, etc.) the employer shall assure that personal identifiers are removed before access is pro-

vided. If the employer can demonstrate that removal of personal identifiers from an analysis is not feasible, access to the personally identifiable portions of the analysis need not be provided.

(3) Department access.

(a) Each employer shall upon request, and without derogation of any rights under the Constitution or the Washington Industrial Safety and Health Act, that the employer chooses to exercise, assure the prompt access of representatives of the director of the department of labor and industries to employee exposure and medical records and to analyses using exposure or medical records. Rules of agency practice and procedures governing WISHA access to employee medical records are contained in this chapter.

(b) Whenever the department seeks access to personally identifiable employee medical information by presenting to the employer a written access order, the employer shall prominently post a copy of the written access order and its accompanying cover letter for at least fifteen working days.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05209, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-05209, filed 11/30/83. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05209, filed 8/27/81.]

WAC 296-62-05211 Trade secrets. (1) Except as provided in subsection (2) of this section, nothing in this section precludes an employer from deleting from records requested by a health professional, employee, or designated representative any trade secret data which discloses manufacturing processes, or discloses the percentage of a chemical substance in a mixture, as long as the health professional, employee, or designated representative is notified that information has been deleted. Whenever deletion of trade secret information substantially impairs evaluation of the place where or the time when exposure to a toxic substance or harmful physical agent occurred, the employer shall provide alternative information which is sufficient to permit the requesting party to identify where and when exposure occurred.

(2) The employer may withhold the specific chemical identity, including the chemical name and other specific identification of a toxic substance from a disclosable record provided that:

(a) The claim that the information withheld is a trade secret can be supported;

(b) All other available information on the properties and effects of the toxic substance is disclosed;

(c) The employer informs the requesting party that the specific chemical identity is being withheld as a trade secret; and

(d) The specific chemical identity is made available to health professionals, employees, and designated representatives in accordance with the specific applicable provisions of this subsection.

(3) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity of a toxic substance is necessary for emergency or first-aid treatment, the employer shall immediately disclose the specific chemical identity of a trade secret chemical to the treating physician or nurse, regardless of the existence of a written

statement of need or a confidentiality agreement. The employer may require a written statement of need and confidentiality agreement, in accordance with the provisions of subsections (4) and (5) of this section, as soon as circumstances permit.

(4) In nonemergency situations, an employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under subsection (2) of this section, to a health professional, employee, or designated representative if:

(a) The request is in writing;

(b) The request describes with reasonable detail one or more of the following occupational health needs for the information:

(i) To assess the hazards of the chemicals to which employees will be exposed;

(ii) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels;

(iii) To conduct preassignment or periodic medical surveillance of exposed employees;

(iv) To provide medical treatment to exposed employees;

(v) To select or assess appropriate personal protective equipment for exposed employees;

(vi) To design or assess engineering controls or other protective measures for exposed employees; and

(vii) To conduct studies to determine the health effects of exposure.

(c) The request explains in detail why the disclosure of the specific chemical identity is essential and that, in lieu thereof, the disclosure of the following information would not enable the health professional, employee, or designated representative to provide the occupational health services described in (b) of this subsection:

(i) The properties and effects of the chemical;

(ii) Measures for controlling workers' exposure to the chemical;

(iii) Methods of monitoring and analyzing worker exposure to the chemical; and

(iv) Methods of diagnosing and treating harmful exposures to the chemical.

(d) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and

(e) The health professional, employee, or designated representative and the employer or contractor of the services of the health professional or designated representative agree in a written confidentiality agreement that the health professional, employee, or designated representative will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to WISHA, as provided in subsection (9) of this section, except as authorized by the terms of the agreement or by the employer.

(5) The confidentiality agreement authorized by subsection (4)(d) of this section:

(a) May restrict the use of the information to the health purposes indicated in the written statement of need;

(b) May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable preestimate of likely damages; and

(c) May not include requirements for the posting of a penalty bond.

(6) Nothing in this section is meant to preclude the parties from pursuing noncontractual remedies to the extent permitted by law.

(7) If the health professional, employee, or designated representative receiving the trade secret information decides that there is a need to disclose it to WISHA, the employer who provided the information shall be informed by the health professional prior to, or at the same time as, such disclosure.

(8) If the employer denies a written request for disclosure of a specific chemical identity, the denial must:

(a) Be provided to the health professional, employee, or designated representative within thirty days of the request;

(b) Be in writing;

(c) Include evidence to support the claim that the specific chemical identity is a trade secret;

(d) State the specific reasons why the request is being denied; and

(e) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity.

(9) The health professional, employee, or designated representative whose request for information is denied under subsection (4) of this section may refer the request and the written denial of the request to WISHA for consideration.

(10) When a health professional, employee, or designated representative refers a denial to WISHA under subsection (9) of this section, WISHA shall consider the evidence to determine if:

(a) The employer has supported the claim that the specific chemical identity is a trade secret;

(b) The health professional, employee, or designated representative has supported the claim that there is a medical or occupational health need for the information; and

(c) The health professional, employee, or designated representative has demonstrated adequate means to protect the confidentiality.

(11)(a) If WISHA determines that the specific chemical identity requested under subsection (4) of this section is not a bona fide trade secret, or that it is a trade secret but the requesting health professional, employee, or designated representative has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means for complying with the terms of such agreement, the employer will be subject to citation by WISHA.

(b) If an employer demonstrates to WISHA that the execution of a confidentiality agreement would not provide sufficient protection against the potential harm from the unauthorized disclosure of a trade secret specific chemical identity, the director may issue such orders or impose such additional limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health needs are met without an undue risk of harm to the employer.

(12) Notwithstanding the existence of a trade secret claim, an employer shall upon request, disclose to the director or his representative, any information which this section requires the employer to make available. Where there is a trade secret claim, such claim shall be made no later than at the time the information is provided to the director so that suitable determinations of trade secret status can be made and the necessary protections can be implemented.

(13) Nothing in this section shall be construed as requiring the disclosure under any circumstances of process or percentage of mixture information which is a trade secret.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05211, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05211, filed 8/27/81.]

WAC 296-62-05213 Employee information. (1) Upon an employee's first entering into employment, and at least annually thereafter, each employer shall inform current employees covered by this section of the following:

(a) The existence, location and availability of any records covered by this section;

(b) The person responsible for maintaining and providing access to records; and

(c) Each employee's rights of access to these records.

(2) Each employer shall keep a copy of this standard and its appendices, and make copies readily available upon request, to employees. The employer shall also distribute to current employees any informational materials concerning this section which are made available to the employer by the director for the Washington industrial safety and health division.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05213, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05213, filed 8/27/81.]

WAC 296-62-05215 Transfer of records. (1) Whenever an employer is ceasing to do business, the employer shall transfer all records subject to this section to the successor employer. The successor employer shall receive and maintain these records.

(2) Whenever an employer is ceasing to do business and there is no successor employer to receive and maintain the records subject to this standard, the employer shall notify affected current employees of their rights of access to records at least three months prior to the cessation of the employer's business.

(3) Whenever an employer either is ceasing to do business and there is no successor employer to receive and maintain the records, or intends to dispose of any records required to be preserved for at least thirty years, the employer shall:

(a) Transfer the records to the director of the department of labor and industries if so required by a specific industrial safety and health standard; or

(b) Notify the director of the department of labor and industries in writing of the impending disposal of records at least three months prior to the disposal of the records.

(4) Where an employer regularly disposes of records required to be preserved for at least thirty years, the employer may, with at least three months notice, notify the director of

the department of labor and industries on an annual basis of the records intended to be disposed of in the coming year.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05215, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05215, filed 8/27/81.]

WAC 296-62-05217 Appendices. The information contained in the appendices A and B to this section is not intended, by itself, to create any additional obligations not otherwise imposed by this section nor detract from any existing obligation.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05217, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05217, filed 8/27/81.]

WAC 296-62-05219 Effective date. WAC 296-62-052 through 296-62-05223 shall become effective June 30, 1989.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05219, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05219, filed 8/27/81.]

WAC 296-62-05221 Appendix A—Sample authorization letter for the release of employee medical record information to a designated representative. (Nonmandatory.)

I, (full name of worker/patient) hereby authorize. (individual or organization holding the medical records) to release to (individual or organization authorized to receive the medical information), the following medical information from my personal medical records:

(Describe generally the information desired to be released.)

I give my permission for this medical information to be used for the following purpose:, but I do not give permission for any other use or re-disclosure of this information.

Note: Several extra lines are provided below so that you can place additional restrictions on this authorization letter if you want to. You may, however, leave these lines blank. On the other hand, you may want to (1) specify a particular expiration date for this letter (if less than one year); (2) describe medical information to be created in the future that you intend to be covered by this authorization letter; or (3) describe portions of the medical information in your records which you do not intend to be released as a result of this letter.)

Full Name of Employee or Legal Representative

Signature of Employee or Legal Representative

Date of Signature

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05221, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05221, filed 8/27/81.]

WAC 296-62-05223 Appendix B—Availability of NIOSH Registry of Toxic Effects of Chemical Substances (RTECS). (Nonmandatory.) WAC 296-62-052 applies to all employee exposure and medical records, and analyses thereof, of employees exposed to toxic substances or harmful physical agents (WAC 296-62-05203). The term "toxic substance or harmful physical agent" is defined by WAC 296-62-05205(11) to encompass chemical substances, biological agents, and physical stresses for which there is evidence of harmful health effects. The standard uses the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) as one of the chief sources of information as to whether evidence of harmful health effects exists. If a substance is listed in the latest printed RTECS, the standard applies to exposure and medical records (and analyses of these records) relevant to employees exposed to the substance.

It is appropriate to note that the final standard does not require that employers purchase a copy of RTECS, and many employers need not consult RTECS to ascertain whether their employee exposure or medical records are subject to the standard. Employers who do not currently have the latest printed edition of the NIOSH RTECS, however, may desire to obtain a copy. The RTECS is issued in an annual printed edition as mandated by section 20(a)(6) of the Occupational Safety and Health Act (29 U.S.C. 669(a)(6)). The introduction to the 1980 printed edition describes the RTECS as follows:

"The 1980 edition of the Registry of Toxic Effects of Chemical Substances, formerly known as the Toxic Substances List, is the ninth revision prepared in compliance with the requirements of Section 20(a)(6) of the Occupational Safety and Health Act of 1970 (Public Law 91-596). The original list was completed on June 28, 1971, and has been updated annually in book format. Beginning in October 1977, quarterly revisions have been provided in microfiche. This edition of the Registry contains 168,096 listings of chemical substances: 45,156 are names of different chemicals with their associated toxicity data and 122,940 are synonyms. This edition includes approximately 5,900 new chemical compounds that did not appear in the 1979 Registry." (p.xi)

"The Registry's purposes are many, and it serves a variety of users. It is a single source document for basic toxicity information and for other data, such as chemical identifiers and information necessary for the preparation of safety directives and hazard evaluations for chemical substances. The various types of toxic effects linked to literature citations provide researchers and occupational health scientists with an introduction to the toxicological literature, making their own review of the toxic hazards of a given substance easier. By presenting data on the lowest reported doses that produce effects by several routes of entry in various species, the Registry furnishes valuable information to those responsible for preparing safety data sheets for chemical substances in the workplace. Chemical and production engineers can use the

Registry to identify the hazards which may be associated with chemical intermediates in the development of final products, and thus can more readily select substitutes or alternative processes which may be less hazardous. Some organizations, including health agencies and chemical companies, have included the NIOSH Registry accession numbers with the listing of chemicals in their files to reference toxicity information associated with those chemicals. By including foreign language chemical names, a start has been made toward providing rapid identification of substances produced in other countries." (p.xi)

"In this edition of the Registry, the editors intend to identify "all known toxic substances" which may exist in the environment and to provide pertinent data on the toxic effects from known doses entering an organism by any route described." (p.xi)

"It must be reemphasized that the entry of a substance in the Registry does not automatically mean that it must be avoided. A listing does mean, however, that the substance has the documented potential of being harmful if misused, and care must be exercised to prevent tragic consequences. Thus, the Registry lists many substances that are common in everyday life and are in nearly every household in the United States. One can name a variety of such dangerous substances: Prescription and nonprescription drugs; food additives; pesticide concentrates, sprays, and dusts; fungicides; herbicides; paints; glazes, dyes; bleaches and other household cleaning agents; alkalies; and various solvents and diluents. The list is extensive because chemicals have become an integral part of our existence."

The RTECS printed edition may be purchased from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, DC 20402 (202-783-3238).

Some employers may desire to subscribe to the quarterly update to the RTECS which is published in a microfiche edition. An annual subscription to the quarterly microfiche may be purchased from the GPO (Order the "Microfiche Edition, Registry of Toxic Effects of Chemical Substances"). Both the printed edition and the microfiche edition of RTECS are available for review at many university and public libraries throughout the country. The latest RTECS editions may also be examined at the OSHA Technical Data Center, Room N2439—Rear, United States Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210 (202-523-9700), or at any OSHA Regional or Area Office (See, major city telephone directories under United States Government-Labor Department)."

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-05223, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-05223, filed 8/27/81.]

PART C—HAZARD COMMUNICATION

WAC 296-62-054 Hazard communication purpose.

(1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, material safety data sheets and employee training.

(2) This occupational safety and health standard is intended to address comprehensively the issue of evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees. Evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: Developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of material safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-62-054, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 84-22-012 (Order 84-22), § 296-62-054, filed 10/30/84; 84-13-001 (Order 84-14), § 296-62-054, filed 6/7/84.]

WAC 296-62-05403 Scope and application. (1) This part requires chemical manufacturers or importers to assess the hazards of chemicals which they produce or import, and all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, material safety data sheets, and information and training. In addition, this part requires distributors to transmit the required information to employers.

Employers who do not produce or import chemicals need only focus on those parts of this rule that deal with establishing a workplace program and communicating information to their workers. Appendix E of this section is a general guide for such employers to help them determine their compliance obligations under the rule.

Even though the Occupational Safety and Health Administration (OSHA) PELs or American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs) may be printed on the material safety data sheet (MSDS), employers within Washington state are required to use the permissible exposure limits (PELs) established in Washington state as listed in the general occupational health standard, WAC 296-62-075, for evaluation of employee exposures and training.

(2) This part applies to any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

(3) This part applies to laboratories only as follows:

(a) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(b) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees when they are in their work areas;

(c) Employers shall ensure that laboratory employees are provided information and training in accordance with WAC 296-62-05415, except for the location and availability of the written hazard communication program under WAC 296-62-05415 (1)(c); and

Note: Laboratories are not required to have a written hazard communication program, but they may be required to have a written chemical hygiene plan under WAC 296-62-400.

(d) Laboratory employers that ship hazardous chemicals are considered to be either a chemical manufacturer or a distributor under this rule, and thus must ensure that any containers of hazardous chemicals leaving the laboratory are labeled in accordance with WAC 296-62-05411, and that a material safety data sheet is provided to distributors and other employers in accordance with WAC 296-62-05413.

(4) In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this part applies to these operations only as follows:

(a) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(b) Employers shall maintain copies of any material safety data sheets that are received with incoming shipments of the sealed containers of hazardous chemicals, shall obtain a material safety data sheet as soon as possible for sealed containers of hazardous chemicals received without a material safety data sheet if an employee requests the material safety data sheet, and shall ensure that the material safety data sheets are readily accessible during each work shift to employees when they are in their work area(s); and

(c) Employers shall ensure that employees are provided with information and training in accordance with WAC 296-62-05415 (except for the location and availability of the written hazard communication program under WAC 296-62-05415 (1)(c)) to the extent necessary to protect them in the event of a spill or leak of a hazardous chemical from a sealed container.

(5) This part does not require labeling of the following chemicals:

(a) Any pesticide as such term is defined in the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), when subject to the labeling requirements of that act and labeling regulations issued under that act by the Environmental Protection Agency;

(b) Any chemical substance or mixture as such terms are defined in the Toxic Substance Control Act (15 U.S.C. 2601 et seq.), when subject to the labeling requirements of that act and labeling requirements issued under that act by the Environmental Protection Agency;

(c) Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device or product, including materials intended for use as ingredients in such products (e.g., flavors and fragrances), as such terms are defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.) or the Virus-Serum Toxin Act of 1913 (21 U.S.C. 151 et seq.) and regulations issued under those acts, when they are subject to the labeling requirements under those acts by either the Food and Drug Administration or the department of agriculture;

(d) Any distilled spirits (beverage alcohols), wine, or malt beverage intended for nonindustrial use, as such terms are defined in the Federal Alcohol Administration Act (27 U.S.C. 201 et seq.) and regulations issued under that act, when subject to the labeling requirements of that act and labeling regulations issued under that act by the Bureau of Alcohol, Tobacco, and Firearms;

(e) Any consumer product or hazardous substance as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substances Act (15 U.S.C. 1261 et seq.) respectively, when subject to a consumer product safety standard or labeling requirement of those acts, or regulations issued under those acts by the Consumer Product Safety Commission; and

(f) Agricultural or vegetable seed treated with pesticides and labeled in accordance with the Federal Seed Act (7 U.S.C. 1551 et seq.) and the labeling requirements issued under that act by the department of agriculture.

(6) This part does not apply to:

(a) Any hazardous waste as such term is defined by the Hazardous Waste Management Act chapter 70.105 RCW, when subject to regulations issued under that act by the department of ecology which describes specific safety, labeling, personnel training and other standards for the accumulation, handling and management of hazardous waste;

(b) Any hazardous waste as such term is defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901 et seq.), when subject to regulations issued under that act by the Environmental Protection Agency;

(c) Any hazardous substance as such term is defined by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 et seq.), when the hazardous substance is the focus of remedial or removal action being conducted under CERCLA in accordance with Environmental Protection Agency regulations;

(d) Tobacco or tobacco products;

(e) Wood or wood products, including lumber which will not be processed, where the chemical manufacturer or importer can establish that the only hazard they pose to the employees is the potential for flammability or combustibility (wood or wood products which have been treated with hazardous chemicals covered by this standard, and wood which may be subsequently sawed or cut, generating dust, are not exempted);

(f) Articles (as that term is defined in WAC 296-62-05405(1));

(g) Food or alcoholic beverages which are sold, used, or prepared in a retail establishment (such as grocery store, restaurant, or drinking place), and foods intended for personal consumption by employees while in the workplace;

(h) Any drug, as that term is defined in the Federal Food, Drug, and Cosmetic Act (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (e.g., tablets or pills); drugs which are packaged by the chemical manufacturer for sale to consumers in a retail establishment (e.g., over-the-counter drugs); and drugs intended for personal consumption by employees while in the workplace (e.g., first aid supplies);

(i) Cosmetics which are packaged for sale to consumers in a retail establishment, and cosmetics intended for personal consumption by employees while in the workplace;

(j) Any consumer product or hazardous substance, as those terms are defined in the Consumer Product Safety Act (15 U.S.C. 2051 et seq.) and Federal Hazardous Substance Act (15 U.S.C. 1261 et seq.) respectively, where the employer can show that it is used in the workplace for the purpose intended by the chemical manufacturer or importer of the product, and the use results in a duration and frequency of exposure which is not greater than the range of exposures that could reasonably be experienced by consumers when used for the purpose intended;

(k) Ionizing and nonionizing radiation; and

(l) Biological hazards.

[Statutory Authority: RCW 49.17.010, [49.17].050 and [49.17].060. 95-22-015, § 296-62-05403, filed 10/20/95, effective 1/16/96. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05403, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05403, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-05403, filed 11/30/87. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05403, filed 5/22/86. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-05403, filed 4/19/85; 84-22-012 (Order 84-22), § 296-62-05403, filed 10/30/84; 84-13-001 (Order 84-14), § 296-62-05403, filed 6/7/84.]

WAC 296-62-05405 Definitions applicable to this part. (1) Article means a manufactured item other than a fluid or particle:

(a) Which is formed to a specific shape or design during manufacture;

(b) Which has end use function(s) dependent in whole or in part upon its shape or design during end use; and

(c) Which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical (as determined under WAC 296-62-05407), and does not pose a physical hazard or health risk to employees.

(2) Chemical means any element, chemical compound or mixture of elements and/or compounds.

(3) Chemical manufacturer means an employer with a workplace where chemical(s) are produced for use or distribution.

(4) Chemical name means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation.

(5) Combustible liquid means any liquid having a flash-point at or above 100°F (37.8°C), but below 200°F (93.3°C), except any mixture having components with flashpoints of 200°F (93.3°C), or higher, the total volume of which make up ninety-nine percent or more of the total volume of the mixture.

(6) Commercial account means an arrangement whereby a retail distributor sells hazardous chemical(s) to an employer, generally in large quantities over time and/or at costs that are below the regular retail price.

(7) Common name means any designation or identification such as code name, code number, trade name, brand

name or generic name used to identify a chemical other than by its chemical name.

(8) Compressed gas means:

(a) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or

(b) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C); or

(c) A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

(9) Container means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this part, pipes or piping systems are not considered to be containers.

(10) Designated representative means any individual or organization to whom an employee gives written authorization to exercise such employee's rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

(11) Director means the director of the department of labor and industries or his/her designee.

(12) Distributor means a business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers.

(13) Employee means an employee of an employer who is employed in the business of his or her employer whether by way of manual labor or otherwise and every person in this state who is engaged in the employment of or who is working under an independent contract the essence of which is personal labor for an employer under this standard whether by way of manual labor or otherwise. However, for the purposes of this part, employee shall not mean immediate family members of the officers of any corporation, partnership, sole proprietorship, or other business entity or officers of any closely held corporation engaged in agricultural production of crops or livestock. This part applies to employees who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies.

(14) Employer means any person, firm, corporation, partnership, business trust, legal representative, or other business entity that engages in any business, industry, profession, or activity in this state and employs one or more employees or who contract with one or more persons, the essence of which is the personal labor of such person or persons and includes the state, counties, cities, and all municipal corporations, public corporations, political subdivisions of the state, and charitable organizations. This part applies to employers engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor.

(15) Explosive means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

(16) Exposure or exposed means that an employee is/was subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes potential (e.g., accidental or possible) exposure.

(17) Flammable means a chemical that falls into one of the following categories:

(a) Aerosol flammable means an aerosol that, when tested by the method described in 16 CFR 1500.45 yields a flame projection exceeding eighteen inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(b) Gas, flammable means:

(i) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen percent by volume or less; or

(ii) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve percent by volume, regardless of the lower limit;

(c) Liquid, flammable means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up ninety-nine percent or more of the total volume of the mixture.

(d) Solid, flammable means a solid, other than a blasting agent or explosive as defined in WAC 296-52-417 or 29 CFR 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

(18) Flashpoint means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(a) Tagliabue closed tester: (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100°F (37.8°C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(b) Pensky-Martens closed tester: (See American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100°F (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(c) Setaflash closed tester: (See American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Note: Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

(19) Foreseeable emergency means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous chemical into the workplace.

(20) Hazardous chemical means any chemical which is a physical hazard or a health hazard.

(21) Hazard warning means any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the specific physical and health hazard(s), including target organ effects, of the chemical(s) in the container(s). (See definition for "physical hazard" and "health hazard" to determine the hazards which must be covered.)

(22) Health hazard means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A provides further definitions and explanations of the scope of health hazards covered by this part, and Appendix B describes the criteria to be used to determine whether or not a chemical is to be considered hazardous for purposes of this standard.

(23) Identity means any chemical or common name which is indicated on the material safety data sheet (MSDS) for the chemical. The identity used shall permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS.

(24) Immediate use means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

(25) Importer means the first business within the Customs Territory of the United States which receives hazardous chemicals produced in other countries, for the purpose of supplying them to distributors or employers within the United States.

(26) Label means any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

(27) Material safety data sheet (MSDS) means written or printed material concerning a hazardous chemical which is prepared in accordance with WAC 296-62-05413.

(28) Mixture means any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

(29) Organic peroxide means an organic compound that contains the bivalent-O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

(30) Oxidizer means a chemical other than a blasting agent or explosive as defined in WAC 296-52-417 or CFR 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

(31) Permissible exposure limits (PELs) refer to airborne concentrations of substances without regard to the use of respiratory protection and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. The permissible exposure limits (PELs) shall include the following four categories:

(a) Permissible exposure limits - Time-weighted average (PEL-TWA) is the time weighted average airborne exposure to any 8-hour work shift of a 40-work week which shall not be exceeded.

(b) Permissible exposure limits - Short-term exposure limit (PEL-STEL) is the employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified in a parenthetical notation below the limit. If another time period is specified, the time weighted average exposure over that time period shall not be exceeded at any time during the working day.

(c) Permissible exposure limits - Ceiling (PEL-C) is the employee's exposure which shall not be exceeded during any part of the work day. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time over a working day.

(d) "Skin" notation is the potential contribution to the overall employee exposure by the cutaneous route including mucous membranes and eye, either by airborne, or more particularly, by direct contact with the substance. These substances are identified as having a "skin" notation in the OSHA and WISHA PEL tables (29 CFR Part 1910 Subpart Z and WAC 296-62-075, respectively).

(32) Physical hazard means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

(33) Produce means to manufacture, process, formulate, blend, extract, generate, emit, or repackage.

(34) Purchaser means an employer with a workplace who purchases a hazardous chemical for use within that workplace.

(35) Pyrophoric means a chemical that will ignite spontaneously in air at a temperature of 130°F (54.4°C) or below.

(36) Responsible party means someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

(37) Specific chemical identity means the chemical name, Chemical Abstracts Service (CAS) registry number, or any other information that reveals the precise chemical designation of the substance.

(38) Threshold limit values (TLVs) refer to airborne concentrations of substances without regard to the use of respiratory protection and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. The TLV includes the TLV-Time weighted average (TLV-TWA), TLV-Short term exposure limit (TLV-STEL), TLV-Ceiling (TLV-Ceiling) and "skin" notation as stated in the most recent edition of the *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* from the American Conference of Governmental Industrial Hygienists (ACGIH).

(39) Trade secret means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. WAC 296-62-05427, Appen-

dix D, provides a legal definition of trade secret and WAC 296-62-05417 sets out the criteria to be used in evaluating trade secrets.

(40) Unstable (reactive) means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

(41) Use means to package, handle, react, emit, extract, generate as a by-product, or transfer.

(42) Water-reactive means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

(43) Work area means a room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

(44) Workplace means an establishment, job site, or project, at one geographical location containing one or more work areas.

[Statutory Authority: RCW 49.17.010, [49.17].050 and [49.17].060. 95-22-015, § 296-62-05405, filed 10/20/95, effective 1/16/96. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05405, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05405, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-05405, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-05405, filed 4/27/87. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05405, filed 5/22/86. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-05405, filed 4/19/85; 84-22-012 (Order 84-22), § 296-62-05405, filed 10/30/84; 84-13-001 (Order 84-14), § 296-62-05405, filed 6/7/84.]

WAC 296-62-05407 Hazard determination. (1)

Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to determine if they are hazardous. Employers are not required to evaluate chemicals unless they choose not to rely on the evaluation performed by the chemical manufacturer or importer for the chemical to satisfy this requirement.

(2) Chemical manufacturers, importers or employers evaluating chemicals shall identify and consider the available scientific evidence concerning physical and health hazards. For health hazards, evidence which is statistically significant and which is based on at least one positive study conducted in accordance with established scientific principles is considered to be sufficient to establish a hazardous effect if the results of the study meet the definitions of health hazards in this part. WAC 296-62-05421, Appendix A, shall be consulted for the scope of health hazards covered, and WAC 296-62-05423, Appendix B, shall be consulted for the criteria to be followed with respect to the completeness of the evaluation, and the data to be reported.

(3) The chemical manufacturer, importer or employer evaluating chemicals shall treat the following sources as establishing that the chemicals listed in them are hazardous:

(a) Chapter 296-62 WAC, General occupational health standard;

(b) 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA); or

(c) *Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment*, American Confer-

ence of Governmental Industrial Hygienists (ACGIH) (latest edition).

(d) The chemical manufacturer, importer, or employer is responsible for evaluating the hazards associated with the chemicals in these source lists in accordance with this requirement of the standard.

(4) Chemical manufacturers, importers and employers evaluating chemicals shall treat the following sources as establishing that a chemical is a carcinogen or potential carcinogen for hazard communication purposes:

(a) National Toxicology Program (NTP), Annual Report on Carcinogens (latest edition);

(b) International Agency for Research on Cancer (IARC) Monographs (latest editions);

(c) Chapter 296-62 WAC, General occupational health standards; or

(d) 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration.

Note: The *Registry of Toxic Effects of Chemical Substances* published by the National Institute for Occupational Safety and Health indicates whether a chemical has been found by NTP or IARC to be a potential carcinogen.

(5) The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows:

(a) If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous;

(b) If a mixture has not been tested as a whole to determine whether the mixture is a health hazard, the mixture shall be assumed to present the same health hazards as do the components which comprise one percent (by weight or volume) or greater of the mixture, except that the mixture shall be assumed to present a carcinogenic hazard if it contains a component in concentrations of 0.1 percent or greater which is considered to be a carcinogen under WAC 296-62-05407(4);

(c) If a mixture has not been tested as a whole to determine whether the mixture is a physical hazard, the chemical manufacturer, importer, or employer may use whatever scientifically valid data is available to evaluate the physical hazard potential of the mixture; and

(d) If the chemical manufacturer, importer, or employer has evidence to indicate that a component present in the mixture in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established WISHA or OSHA permissible exposure limit or ACGIH threshold limit value, or could present a health risk to employees in those concentrations, the mixture shall be assumed to present the same hazard.

(6) Chemical manufacturers, importers, or employers evaluating chemicals shall describe in writing the procedures they use to determine the hazards of the chemical they evaluate. The written procedures are to be made available, upon request, to employees, their designated representatives, the director or his/her designee and the National Institute of Occupational Safety and Health (NIOSH). The written description may be incorporated into the written hazard communication program required under WAC 296-62-05409.

(2001 Ed.)

[Statutory Authority: RCW 49.17.010, [49.17].050 and [49.17].060. 95-22-015, § 296-62-05407, filed 10/20/95, effective 1/16/96. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05407, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05407, filed 7/6/88. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05407, filed 5/22/86. Statutory Authority: RCW 49.17.040 and 49.17.050. 84-13-001 (Order 84-14), § 296-62-05407, filed 6/7/84.]

WAC 296-62-05409 Written hazard communication program. (1) Employers shall develop, implement, and maintain at the workplace a written hazard communication program for their workplaces which at least describes how the criteria specified in WAC 296-62-05411, 296-62-05413 and 296-62-05415, for labels and other forms of warning, material safety data sheets, and employee information and training will be met, and which also includes the following:

(a) A list of the hazardous chemicals known to be present using an identity that is referenced on the appropriate material safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas); and

(b) The methods the employer will use to inform employees of the hazards of nonroutine tasks (for example, the cleaning of reactor vessels), and the hazards associated with chemicals contained in unlabeled pipes in their work areas.

(2) Multi-employer workplaces. Employers who produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed (for example, employees of a construction contractor working on site) shall additionally ensure that the hazard communication programs developed and implemented under this part include the following:

(a) The methods the employer will use to provide the other employer(s) with a copy of the material safety data sheet, or to make it available at a central location on the worksite, for each hazardous chemical the other employer(s)' employees may be exposed to while working;

(b) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and

(c) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.

(3) The employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this part.

(4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the director or his/her designee and the National Institute of Occupational Safety and Health (NIOSH), in accordance with the requirements of WAC 296-62-05209.

(5) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the written hazard communication program may be kept at the primary workplace facility.

[Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05409, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05409, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 84-13-001 (Order 84-14), § 296-62-05409, filed 6/7/84.]

[Title 296 WAC—p. 1403]

WAC 296-62-05411 Labels and other forms of warning. (1) The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:

- (a) Identity of the hazardous chemical(s);
- (b) Appropriate hazard warnings; and
- (c) Name and address of the chemical manufacturer, importer, or other responsible party.

(2)(a) For solid metal (such as a steel beam or a metal casting), solid wood, or plastic items that are not exempted as articles due to their downstream use, or shipments of whole grain, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes;

(b) The label may be transmitted with the initial shipment itself, or with the material safety data sheet that is to be provided prior to or at the time of the first shipment; and

(c) This exception to requiring labels on every container of hazardous chemicals is only for the solid material itself and does not apply to hazardous chemicals used in conjunction with, or known to be present with, the material and to which employees handling the items in transit may be exposed (for example, cutting fluids or pesticides in grain).

(3) Chemical manufacturers, importers, or distributors shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged, or marked in accordance with this part in a manner which does not conflict with the requirements of the Hazardous Materials Transportation Act (49 U.S.C. 1801 et seq.) and regulations issued under that act by the department of transportation.

(4) If the hazardous chemical is regulated by WISHA or OSHA in a substance-specific health standard, the chemical manufacturer, importer, distributor or employer shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard.

(5) Except as provided in subsection (6) and (7) of this section, the employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with the following information:

- (a) Identity of the hazardous chemical(s) contained therein; and
- (b) Appropriate hazard warnings, or alternatively, words, pictures, symbols, or combination thereof, which provide at least general information regarding the hazards of the chemicals, and which, in conjunction with the other information immediately available to employees under the hazard communication program, will provide the employees with the specific information regarding the physical and health hazards of the hazardous chemical.

(6) The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by subsection (5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift.

(7) The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer. For purposes of this part, drugs which are dispensed by a pharmacy to a health care provider for direct administration to a patient are exempted from labeling.

(8) The employer shall not remove or deface existing labels on incoming containers of hazardous chemicals, unless the container is immediately marked with the required information.

(9) The employer shall ensure that labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift. Employers having employees who speak other languages may add the information in their language to the material presented, as long as the information is presented in English as well.

(10) The chemical manufacturer, importer, distributor or employer need not affix new labels to comply with this part if existing labels already convey the required information.

(11) Chemical manufacturers, importers, distributors, or employers who become newly aware of any significant information regarding the hazards of a chemical shall revise the labels for the chemical within three months of becoming aware of the new information. Labels on containers of hazardous chemicals shipped after that time shall contain the new information. If the chemical is not currently produced or imported, the chemical manufacturer, importers, distributor, or employer shall add the information to the label before the chemical is shipped or introduced into the workplace again.

(12) Retention of DOT markings, placards and labels.

(a) Any employer who receives a package of hazardous material which is required to be marked, labeled or placarded in accordance with the U.S. Department of Transportation's Hazardous Materials Regulations (49 CFR Parts 171 through 180) shall retain those markings, labels and placards on the package until the packaging is sufficiently cleaned of residue and purged of vapors to remove any potential hazards.

(b) Any employer who receives a freight container, rail freight car, motor vehicle, or transport vehicle that is required to be marked or placarded in accordance with the Hazardous Materials Regulations shall retain those markings and placards on the freight container, rail freight car, motor vehicle or transport vehicle until the hazardous materials which require the marking or placarding are sufficiently removed to prevent any potential hazards.

(c) Markings, placards and labels shall be maintained in a manner that ensures that they are readily visible.

(d) For nonbulk packages which will not be reshipped, the provision of this section are met if a label or other acceptable marking is affixed in accordance with the Hazard Communication Standard chapter 296-62 WAC.

(e) For the purposes of this section, the term "hazardous material" and any other terms not defined in this section have the same definition as in the Hazardous Materials Regulations (49 CFR Parts 171 through 180).

[Statutory Authority: Chapter 49.17 RCW. 95-04-006, § 296-62-05411, filed 1/18/95, effective 3/10/95; 94-16-145, § 296-62-05411, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05411, filed 7/6/88.

Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-05411, filed 4/19/85; 84-13-001 (Order 84-14), § 296-62-05411, filed 6/7/84.]

WAC 296-62-05413 Material safety data sheets. (1)

Chemical manufacturers and importers shall obtain or develop a material safety data sheet (MSDS) for each hazardous chemical they produce or import. Employers shall have a material safety data sheet in the workplace for each hazardous chemical which they use.

(2) Each material safety data sheet shall be in English (although the employer may maintain copies in other languages) and shall contain at least the following information:

(a) The identity used on the label, and, except as provided for in WAC 296-62-05417 on trade secrets:

(i) If the hazardous chemical is a single substance, its chemical and common name(s);

(ii) If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or

(iii) If the hazardous chemical is a mixture which has not been tested as a whole:

(A) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise 1% or greater of the composition, except that chemicals identified as carcinogens under WAC 296-62-05407(4) shall be listed if the concentrations are 0.1% or greater; and

(B) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise less than one percent (0.1% for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established WISHA or OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health risk to employees; and

(C) The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture;

(b) Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);

(c) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity;

(d) The acute and chronic health hazards of the hazardous chemical, including signs and symptoms of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical;

(e) The primary route(s) of entry;

(f) The WISHA or OSHA permissible exposure limit, ACGIH threshold limit value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the material safety data sheet (the PELs and TLVs include the 8-hour TWA, STEL, ceiling value and skin notation defined in WAC 296-62-05405), where available;

(g) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition) or has been found to be a potential

(2001 Ed.)

carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions), or by WISHA or OSHA;

(h) Any generally applicable precautions for safe handling and use which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks;

(i) Any generally applicable control measures which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, such as appropriate engineering controls, work practices, or personal protective equipment;

(j) Emergency and first aid procedures;

(k) The date of preparation of the material safety data sheet or the last change to it; and

(l) The name, address and telephone number of the chemical manufacturer, importer, employer or other responsible party preparing or distributing the material safety data sheet, who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

(3) If no relevant information is found for any given category on the material safety data sheet, the chemical manufacturer, importer or employer preparing the material safety data sheet shall mark it to indicate that no applicable information was found.

(4) Where complex mixtures have similar hazards and contents (i.e. the chemical ingredients are essentially the same, but the specific composition varies from mixture to mixture), the chemical manufacturer, importer or employer may prepare one material safety data sheet to apply to all of these similar mixtures.

(5) The chemical manufacturer, importer or employer preparing the material safety data sheet shall ensure that the information recorded accurately reflects the scientific evidence used in making the hazard determination. If the chemical manufacturer, importer or employer preparing the material safety data sheet becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the material safety data sheet within three months. If the chemical is not currently being produced or imported the chemical manufacturer or importer shall add the information to the material safety data sheet before the chemical is introduced into the workplace again.

(6)(a) Chemical manufacturers or importers shall ensure that distributors and employers are provided an appropriate material safety data sheet with their initial shipment, and with the first shipment after a material safety data sheet is updated;

(b) The chemical manufacturer or importer shall either provide material safety data sheets with the shipped containers or send them to the distributor or employer prior to or at the time of the shipment;

(c) If the material safety data sheet is not provided with a shipment that has been labeled as a hazardous chemical, the distributor or employer shall obtain one from the chemical manufacturer or importer as soon as possible; and

(d) The chemical manufacturer or importer shall also provide distributors or employers with a material safety data sheet upon request.

(7)(a) Distributors shall ensure that material safety data sheets, and updated information, are provided to other distributors and employers with their initial shipment and with the first shipment after a material safety data sheet is updated;

(b) The distributor shall either provide material safety data sheets with the shipped containers, or send them to the other distributor or employer prior to or at the time of the shipment;

(c) Retail distributors selling hazardous chemicals to employers having a commercial account shall provide a material safety data sheet to such employers upon request, and shall post a sign or otherwise inform them that a material safety data sheet is available;

(d) Wholesale distributors selling hazardous chemicals to employers over-the-counter may also provide material safety data sheets upon request of the employer at the time of the over-the-counter purchase, and shall post a sign or otherwise inform such employers that a material safety data sheet is available;

(e) If an employer without a commercial account purchases a hazardous chemical from a retail distributor not required to have material safety data sheets on file (i.e., the retail distributor does not have a commercial account and does not use the materials), the retail distributor shall provide the employer, upon request, with the name, address, and telephone number of the chemical manufacturer, importer, or distributor from which a material safety data sheet can be obtained;

(f) Wholesale distributors shall also provide material safety data sheets to employers or other distributors upon request; and

(g) Chemical manufacturers, importers, and distributors need not provide material safety data sheets to retail distributors that have informed them that the retail distributor does not sell the product to commercial accounts or open the sealed container to use it in their own workplaces.

(8) The employer shall maintain in the workplace copies of the required material safety data sheets for each hazardous chemical, and shall ensure that they are readily accessible during each work shift to employees when they are in their work area(s). (Electronic access, microfiche, and other alternatives to maintaining paper copies of the material safety data sheets are permitted as long as no barriers to immediate employee access in each workplace are created by such options.)

(9) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the material safety data sheets may be kept at a central location at the primary workplace facility. In this situation, the employer shall ensure that employees can immediately obtain the required information in an emergency.

(10) Material safety data sheets may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be more appropriate to address the hazards of a process rather than individual hazardous chemicals. However, the

employer shall ensure that in all cases the required information is provided for each hazardous chemical, and is readily accessible during each work shift to employees when they are in their work area(s).

(11) Material safety data sheets shall also be made readily available, upon request, to designated representatives and to the director or his/her designee in accordance with the requirements of WAC 296-62-05209. NIOSH shall also be given access to material safety data sheets in the same manner.

(12) If a purchaser has not received a material safety data sheet within thirty calendar days after making a written request to the chemical manufacturer, importer, or distributor in accordance with WAC 296-62-05413(6), he/she may make a written request for assistance to the Department of Labor and Industries, Right-to-Know Program, P.O. Box 44610, Olympia, Washington 98504-4610. Such written request shall include:

(a) A copy of the purchaser's written request to the chemical manufacturer, importer, or distributor;

(b) The name of the product suspected of containing a hazardous chemical;

(c) The identification number of the product if available;

(d) A copy of the product label if available; and

(e) The name and address of the chemical manufacturer, importer, or distributor from whom the product was obtained.

Upon receipt of a written request for material safety data sheet, the department shall attempt to procure the material safety data sheet from the chemical manufacturer, importer or distributor and upon procurement, shall forward a copy of the material safety data sheet at no cost to the purchaser. In providing this service priority will be given to small employers.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-11-055, § 296-62-05413, filed 5/20/97, effective 8/1/97. Statutory Authority: RCW 49.17.010, [49.17.]050 and [49.17.]060. 95-22-015, § 296-62-05413, filed 10/20/95, effective 1/16/96. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05413, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05413, filed 7/6/88. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05413, filed 5/22/86. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-05413, filed 4/19/85; 84-22-012 (Order 84-22), § 296-62-05413, filed 10/30/84; 84-13-001 (Order 84-14), § 296-62-05413, filed 6/7/84.]

WAC 296-62-05415 Employee information and training. (1) Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area. Such information and training shall be tailored to the types of hazards to which the employees will be exposed. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals. Chemical-specific information must always be available through labels and material safety data sheets.

Note: See Appendix E for guidelines.

(2) Information. Employees shall be informed of:

(a) The requirements of this part;

(b) Any operations in their work area where hazardous chemicals are present; and

(c) The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this part.

Note: Laboratories are not required to have a written hazard communication program, but it is recommended.

(3) Training. Employee training shall include at least:

(a) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

(b) The physical and health hazards of the chemicals in the work area including the likely physical symptoms or effects of overexposure;

(c) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and

(d) The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

(4) Upon receipt of a written or verbal request, the department shall prepare and make available (within available resources) to employers or the public a translation in Cambodian, Chinese, Korean, Spanish, or Vietnamese any of the following:

(a) An employer's written hazard communication program;

(b) A material safety data sheet; or

(c) Written materials prepared by the department to inform employees of their rights relating to hazard communication, WAC 296-62-054 through 296-62-05429.

Note: Written requests should be directed to the Department of Labor and Industries, Right-to-know Program, P.O. Box 44610, Olympia, Washington 98504-4610.

(5) An employer employing employees who have trouble communicating in English shall make reasonable efforts to post notices in the employees' native languages as provided by the department.

[Statutory Authority: Chapter 49.17 RCW, 94-16-145, § 296-62-05415, filed 8/3/94, effective 9/12/94. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05415, filed 5/22/86. Statutory Authority: RCW 49.17.040 and 49.17.050. 84-13-001 (Order 84-14), § 296-62-05415, filed 6/7/84.]

WAC 296-62-05417 Trade secrets. (1) The chemical manufacturer, importer, or employer may withhold the specific chemical identity, including the chemical name and other specific identification of a hazardous chemical, from the material safety data sheet, provided that:

(a) The claim that the information withheld is a trade secret can be supported;

(b) Information contained in the material safety data sheet concerning the properties and effects of the hazardous chemical is disclosed;

(c) The material safety data sheet indicates that the specific chemical identity is being withheld as a trade secret; and

(d) The specific chemical identity is made available to health professionals, employees, and designated representatives, in accordance with the applicable provisions of this section.

(2) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous chemical is necessary for emergency or first-aid treatment, the chemical manufacturer, importer, or employer shall immediately disclose the specific chemical identity of a trade secret chemical to that treating physician or nurse, regardless of the existence of a written statement of need or a confidentiality agreement. The chemical manufacturer, importer, or employer may require a written statement of need and confidentiality agreement, in accordance with the provisions of subsections (3) and (4) of this section, as soon as circumstances permit.

(3) In nonemergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under subsection (1) of this section, to a health professional (i.e. physician, registered nurse, industrial hygienist, toxicologist, epidemiologist or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if:

(a) The request is in writing;

(b) The request describes with reasonable detail one or more of the following occupational health needs for the information:

(i) To assess the hazards of the chemicals to which employees will be exposed;

(ii) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels;

(iii) To conduct preassignment or periodic medical surveillance of exposed employees;

(iv) To provide medical treatment to exposed employees;

(v) To select or assess appropriate personal protective equipment for exposed employees;

(vi) To design or assess engineering controls or other protective measures for exposed employees; and

(vii) To conduct studies to determine the health effects of exposure.

(c) The request explains in detail why the disclosure of the specific chemical identity is essential and that, in lieu thereof, the disclosure of the following information to the health professional, employee, or designated representatives, would not satisfy the purposes described in (b) of this subsection:

(i) The properties and effects of the chemical;

(ii) Measures for controlling workers' exposure to the chemical;

(iii) Methods of monitoring and analyzing worker exposure to the chemical; and

(iv) Methods of diagnosing and treating harmful exposures to the chemical;

(d) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and

(e) The health professional, and the employer or contractor of the services of the health professional (i.e., downstream employer, labor organization, or individual employee), employee, or designated representative, agree in a written confidentiality agreement that the health professional employee, or designated representative, will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to the department, as provided in subsection (6) of this section, except as authorized by the terms of the agreement or by the chemical manufacturer, importer, or employer.

(4) The confidentiality agreement authorized by subsection (3)(e) of this section:

(a) May restrict the use of the information to the health purposes indicated in the written statement of need;

(b) May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable preestimate of likely damages; and

(c) May not include requirements for the posting of a penalty bond.

(5) Nothing in this part is meant to preclude the parties from pursuing noncontractual remedies to the extent permitted by law.

(6) If the health professional, employee, or designated representative receiving the trade secret information decides that there is a need to disclose it to the department, the chemical manufacturer, importer, or employer who provided the information shall be informed by the health professional, employee, or designated representative prior to, or at the same time as, such disclosure.

(7) If the chemical manufacturer, importer, or employer denies a written request for disclosure of a specific chemical identity, the denial must:

(a) Be provided to the health professional, employee, or designated representative, within thirty days of the request;

(b) Be in writing;

(c) Include evidence to support the claim that the specific chemical identity is a trade secret;

(d) State the specific reasons why the request is being denied; and

(e) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity.

(8) The health professional, employee, or designated representative, whose request for information is denied under subsection (3) of this section may refer the request and the written denial of the request to the department for consideration.

(9) When a health professional, employee, or designated representative refers the denial to the department under subsection (8) of this section, the director or his/her designee shall consider the evidence to determine if:

(a) The chemical manufacturer, importer, or employer has supported the claim that the specific chemical identity is a trade secret;

(b) The health professional, employee, or designated representative, has supported the claim that there is a medical or occupational health need for the information; and

(c) The health professional, employee, or designated representative, has demonstrated adequate means to protect the confidentiality.

(10) If the director or his/her designee determines that the specific chemical identity requested under subsection (3) of this section is not a bona fide trade secret, or that it is a trade secret but the requesting health professional, employee, or designated representative has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means to protect the confidentiality of the information, the chemical manufacturer, importer, or employer will be subject to citation by the department.

(11) If a chemical manufacturer, importer, or employer demonstrates to the department that the execution of a confidentiality agreement would not provide sufficient protection against the potential harm from the unauthorized disclosure of a trade secret specific chemical identity, the director or his/her designee may issue such orders or impose such additional limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health services are provided without an undue risk of harm to the chemical manufacturer, importer, or employer.

(12) If, following the issuance of a citation and any protective orders, the chemical manufacturer, importer, or employer continues to withhold the information, further action may be taken by the department in accordance with chapter 49.17 RCW.

(13) Notwithstanding the existence of a trade secret claim, a chemical manufacturer, importer, or employer shall, upon request, disclose to the director or his/her designee any information which this section requires the chemical manufacturer, importer, or employer to make available. Where there is a trade secret claim, such claim shall be made no later than at the time the information is provided to the director or his/her designee so that suitable determinations of trade secret status can be made and the necessary protections can be implemented.

(14) Nothing in this section shall be construed as requiring the disclosure under any circumstances of process or percentage of mixture information which is a trade secret.

[Statutory Authority: Chapter 49.17 RCW, 94-16-145, § 296-62-05417, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05417, filed 7/6/88. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05417, filed 5/22/86. Statutory Authority: RCW 49.17.040 and 49.17.050. 84-22-012 (Order 84-22), § 296-62-05417, filed 10/30/84; 84-13-001 (Order 84-14), § 296-62-05417, filed 6/7/84.]

WAC 296-62-05419 Effective dates. Reserved.

[Statutory Authority: Chapter 49.17 RCW, 94-16-145, § 296-62-05419, filed 8/3/94, effective 9/12/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 84-13-001 (Order 84-14), § 296-62-05419, filed 6/7/84.]

WAC 296-62-05421 Appendix A—Health hazard definitions (mandatory). Although safety hazards related to the physical characteristics of a chemical can be objectively

defined in terms of testing requirements (e.g., flammability), health hazard definitions are less precise and more subjective. Health hazards may cause measurable changes in the body—such as decreased pulmonary function. These changes are generally indicated by the occurrence of signs and symptoms in the exposed employees—such as shortness of breath, a nonmeasurable, subjective feeling. Employees exposed to such hazards must be apprised of both the change in body function and the signs and symptoms that may occur to signal that change.

The determination of occupational health hazards is complicated by the fact that many of the effects or signs and symptoms occur commonly in nonoccupationally exposed populations, so that effects of exposure are difficult to separate from normally occurring illnesses. Occasionally, a substance causes an effect that is rarely seen in the population at large, such as angiosarcomas caused by vinyl chloride exposure, thus making it easier to ascertain that the occupational exposure was the primary causative factor. More often, however, the effects are common, such as lung cancer. The situation is further complicated by the fact that most chemicals have not been adequately tested to determine their health hazard potential, and data do not exist to substantiate these effects.

There have been many attempts to categorize effects and to define them in various ways. Generally, the terms "acute" and "chronic" are used to delineate between effects on the basis of severity or duration. "Acute" effects usually occur rapidly as a result of short-term exposures, and are of short duration. "Chronic" effects generally occur as a result of long-term exposure, and are of long duration.

The acute effects referred to most frequently are those defined by the American National Standards Institute (ANSI) standard for Precautionary Labeling of Hazardous Industrial Chemicals (Z129.1-1988) — irritation, corrosivity, sensitization and lethal dose. Although these are important health effects, they do not adequately cover the considerable range of acute effects which may occur as a result of occupational exposure, such as, for example, narcosis.

Similarly, the term chronic effect is often used to cover only carcinogenicity, teratogenicity, and mutagenicity. These effects are obviously a concern in the workplace, but again, do not adequately cover the area of chronic effects, excluding, for example, blood dyscrasias (such as anemia), chronic bronchitis and liver atrophy.

The goal of defining precisely, in measurable terms, every possible health effect that may occur in the workplace as a result of chemical exposures cannot realistically be accomplished. This does not negate the need for employees to be informed of such effects and protected from them.

Appendix B, which is also mandatory, outlines the principles and procedures of hazard assessment.

For purposes of this part, any chemicals which meet any of the following definitions, as determined by the criteria set forth in Appendix B are health hazards. However, this is not intended to be an exclusive categorization scheme. If there are available scientific data that involve other animal species or test methods, they must also be evaluated to determine the applicability of the HCS.

(1) **Carcinogen:** A chemical is considered to be a carcinogen if:

(a) It has been evaluated by the International Agency for Research on Cancer (IARC), and found to be a carcinogen or potential carcinogen; or

(b) It is listed as a carcinogen or potential carcinogen in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(c) It is regulated by WISHA as a carcinogen.

(2) **Corrosive:** A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact. For example, a chemical is considered to be corrosive if, when tested on the intact skin of albino rabbits by the method described by the U.S. Department of Transportation in Appendix A to 49 CFR Part 173, it destroys or changes irreversibly the structure of the tissue at the site of contact following an exposure period of four hours. This term shall not refer to action on inanimate surfaces.

(3) **Highly toxic:** A chemical falling within any of the following categories:

(a) A chemical that has a median lethal dose (LD_{50}) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A chemical that has a median lethal dose (LD_{50}) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

(c) A chemical that has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

(4) **Irritant:** A chemical, which is not corrosive, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of 16 CFR 1500.41 for four hours exposure or by other appropriate techniques, it results in an empirical score of five or more. A chemical is an eye irritant if so determined under the procedure listed in 16 CFR 1500.42 or other appropriate techniques.

(5) **Sensitizer:** A chemical that causes a substantial proportion of exposed people or animals to develop an allergic reaction in normal tissue after repeated exposure to the chemical.

(6) **Toxic:** A chemical falling within any of the following categories:

(a) A chemical that has a median lethal dose (LD_{50}) of more than 50 milligrams per kilogram but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.

(b) A chemical that has a median lethal dose (LD_{50}) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within

24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.

(c) A chemical that has a median lethal concentration (LC₅₀) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than two milligrams per liter but not more than 20 milligrams per liter of mist, fume, or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

(7) Target organ effects: The following is a target organ categorization of effects which may occur, including examples of signs and symptoms and chemicals which have been found to cause such effects. These examples are presented to illustrate the range and diversity of effects and hazards found in the workplace, and the broad scope employers must consider in this area, but are not intended to be all-inclusive.

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| (a) Hepatotoxins: | Chemicals which produce liver damage. |
| Signs & symptoms: | Jaundice, liver enlargement. |
| Chemicals: | Carbon tetrachloride, nitrosamines. |
| (b) Nephrotoxins: | Chemicals which produce kidney damage. |
| Signs & symptoms: | Edema; proteinuria. |
| Chemicals: | Halogenated hydrocarbons; uranium. |
| (c) Neurotoxins: | Chemicals which produce their primary toxic effects on the nervous system. |
| Signs & symptoms: | Narcosis; behavioral changes; decrease in motor functions. |
| Chemicals: | Mercury, carbon disulfide. |
| (d) Agents which act on the blood or hemato-poietic system: | Decrease hemoglobin function; deprive the body of oxygen. |
| Signs & symptoms: | Cyanosis; loss of consciousness. |
| Chemicals: | Carbon monoxide; cyanides. |
| (e) Agents which damage the lung: | Chemicals which irritate or damage the pulmonary tissue. |
| Signs & symptoms: | Cough; tightness in chest; shortness of breath. |
| Chemicals: | Silica; asbestos. |
| (f) Reproductive toxins: | Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). |
| Signs & symptoms: | Birth defects; sterility. |
| Chemicals: | Lead; DBCP. |

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| (g) Cutaneous hazards: | Chemicals which affect the dermal layer of the body. |
| Signs & symptoms: | Defatting of the skin; rashes; irritation. |
| Chemicals: | Ketones; chlorinated compounds. |
| (h) Eye hazards: | Chemicals which affect the eye or visual capacity. |
| Signs & symptoms: | Conjunctivitis; corneal damage. |
| Chemicals: | Organic solvents; acids. |

[Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05421, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05421, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-05421, filed 4/19/85; 84-22-012 (Order 84-22), § 296-62-05421, filed 10/30/84; 84-13-001 (Order 84-14), § 296-62-05421, filed 6/7/84.]

WAC 296-62-05423 Appendix B—Hazard determination (mandatory). The quality of a hazard communication program is largely dependent upon the adequacy and accuracy of the hazard determination. The hazard determination requirement of this standard is performance-oriented. Chemical manufacturers, importers, and employers evaluating chemicals are not required to follow any specific methods for determining hazards, but they must be able to demonstrate that they have adequately ascertained the hazards of the chemicals produced or imported in accordance with the criteria set forth in this appendix.

Hazard evaluation is a process which relies heavily on the professional judgment of the evaluator, particularly in the area of chronic hazards. The performance-orientation of the hazard determination does not diminish the duty of the chemical manufacturer, importer or employer to conduct a thorough evaluation, examining all relevant data and producing a scientifically defensible evaluation. For purposes of this standard, the following criteria shall be used in making hazard determinations that meet the requirements of this standard.

(1) Carcinogenicity: As described in WAC 296-62-05407(4) and Appendix A of this section, a determination by the National Toxicology Program, the International Agency for Research on Cancer, WISHA or OSHA that a chemical is a carcinogen or potential carcinogen will be considered conclusive evidence for purposes of this part. In addition, however, all available scientific data on carcinogenicity must be evaluated in accordance with the provisions of the appendix and the requirements of this standard.

(2) Human data: Where available, epidemiological studies and case reports of adverse health effects shall be considered in the evaluation.

(3) Animal data: Human evidence of health effects in exposed populations is generally not available for the majority of chemicals produced or used in the workplace. Therefore, the available results of toxicological testing in animal populations shall be used to predict the health effects that may be experienced by exposed workers. In particular, the definitions of certain acute hazards refer to specific animal testing results (see Appendix A).

(4) Adequacy and reporting of data. The results of any studies which are designed and conducted according to estab-

lished scientific principles, and which report statistically significant conclusions regarding the health effects of a chemical, shall be a sufficient basis for a hazard determination and reported on any material safety data sheet. In vitro studies alone generally do not form the basis for a definitive finding of a hazard under the HCS since they have a positive or negative result rather than a statistically significant finding.

The chemical manufacturer, importer, or employer may also report the results of other scientifically valid studies which tend to refute the findings of hazard.

[Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05423, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05423, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 84-13-001 (Order 84-14), § 296-62-05423, filed 6/7/84.]

WAC 296-62-05425 Appendix C—Information sources (advisory). The following is a list of available data sources which the chemical manufacturer, importer, or employer may wish to consult to evaluate the hazards of chemicals they produce or import:

(1) Any information in their own company files, such as toxicity testing results or illness experience of company employees.

(2) Any information obtained from the supplier of the chemical, such as material safety data sheets or product safety bulletins.

(3) Any pertinent information obtained from the following source list (latest editions should be used):

Condensed Chemical Dictionary

Van Nostrand Reinhold Co.
135 West 50th Street
New York, NY 10020

The Merck Index: An Encyclopedia of Chemicals and Drugs

Merck and Company, Inc.
126 E. Lincoln Avenue
Rahway, NJ 07065

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man

Geneva: World Health Organization
International Agency for Research on Cancer,
1972

Present (Multivolume work) Summaries are available in supplement volumes.

49 Sheridan Street
Albany, New York 12210

Industrial Hygiene and Toxicology, by F.A. Patty

John Wiley & Sons, Inc.
New York, NY
(Multivolume work)

Clinical Toxicology of Commercial Products

Gleason, Gosselin, and Hodge

Casarett and Doull's Toxicology: The Basic Science of Poisons

Doull, Klaassen, and Amdur
Macmillan Publishing Co., Inc.
New York, NY

Industrial Toxicology, by Alice Hamilton and Harriet L. Hardy

Publishing Sciences Group, Inc.
Acton, MA

Toxicology of the Eye, by W. Morton Grant

Charles C. Thomas
301-327 East Lawrence Avenue
Springfield, IL

Recognition of Health Hazards in Industry

William A. Burgess
John Wiley and Sons
605 Third Avenue
New York, NY 10158

Chemical Hazards of the Workplace

Nick H. Proctor and James P. Hughes
J.P. Lipincott Company
6 Winchester Terrace
New York, NY 10022

Handbook of Chemistry and Physics

Chemical Rubber Company
18901 Cranwood Parkway
Cleveland, OH 44128

Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment and Biological Exposure Indices with Intended Changes

American Conference of Governmental Industrial Hygienists (ACGIH)
6500 Glenway Avenue, Bldg. D-5
Cincinnati, OH 45211

Note: Information on the physical hazards of chemicals may be found in publications of the National Fire Protection Association, Boston, MA.

National Toxicology Program (NTP) Annual Report on Carcinogens (Latest Edition)

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22101

Note: The following documents may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

Occupational Health Guidelines

NIOSH/OSHA (NIOSH Pub. No. 81-123)

NIOSH Pocket Guide to Chemical Hazards

NIOSH Pub. No. 90-117

Registry of Toxic Effects of Chemical Substances (Latest Edition)

Miscellaneous Documents published by the National Institute for Occupational Safety and Health:

- (1) Criteria documents
- (2) Special Hazard Reviews
- (3) Occupational Hazard Assessment
- (4) Current Intelligence Bulletins

WISHA's General Occupational Health Standards, chapter 296-62 WAC.

OSHA's General Industry Standards (29 CFR Part 1910)

NTP Annual Report on Carcinogens and Summary of the Annual Report on Carcinogens

BIBLIOGRAPHIC DATA BASES

Service Provider

File Name

Bibliographic Retrieval Services (BRS),
1200 Route 7,
Latham, NY 12110.

Lockheed - DIALOG Information Service, Inc.,
3460 Hill View Avenue,
Palo Alto, CA 94304.

SDC - Orbit, SDC Information Service,
2500 Colorado Avenue,
Santa Monica, CA 90406.
National Library of Medicine,
Department of Health and Human Services, Public Health Service, National Institutes of Health,
Bethesda, MD 20209.

Pergamon International Information Corp.,
1340 Old Chain Bridge, Rd.,
McLean, VA 22101.
Questel, Inc.,
1625 Eye Street, NW,
Suite 818,
Washington, DC 20006.

Biosis Previews
CA Search
Medlars
NTIS
Hazardline
American Chemical Society Journal
Excerpta Medica
IRCS Medical Science Journal
Pre-Med
Intl. Pharmaceutical Abstracts
Paper Chem
Biosis Prev. Files
CA Search Files
CAB Abstracts
Chemical Exposure Chemname
Chemsis Files
Chemzero
Embase Files
Environmental Bibliographies
Enviroline
Federal Research in Progress
IRL Life Science Collection
NTIS
Occupational Safety and Health (NIOSH)
Paper Chem
CAS Files
Chemdex, 2,3
NTIS

Hazardous Substances Data Bank (NSDB)
Medline Files
Toxline Files
Cancerlit
RTECS
Chemline
Laboratory Hazard Bulletin

CIS/ILO
Cancernet

Chemical Information System ICI (ICIS), Bureau of National Affairs,
1133 15th Street, NW,
Suite 300,
Washington, DC 20005.

Occupational Health Services,
400 Plaza Drive,
Secaucus, NJ 07094.

[Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05425, filed 8/3/94, effective 9/12/94; 88-14-108 (Order 88-11), § 296-62-05425, filed 7/6/88. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05425, filed 5/22/86. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-05425, filed 4/19/85; 84-13-001 (Order 84-14), § 296-62-05425, filed 6/7/84.]

Structure and Nomenclature Search System (SANSS)
Acute Toxicity (RTECS)
Clinical Toxicology of Commercial Products
Oil and Hazardous Materials Technical Assistance Data System
CCRIS
CESARS
MSDS
Hazardline

WAC 296-62-05427 Appendix D. Definition of "trade secret" (mandatory)

The following is a reprint of the *Restatement of Torts* section 757, comment *b* (1939):

b. Definition of trade secret. A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers. It differs from other secret information in a business (see § 759 of the *Restatement of Torts* which is not included in this Appendix) in that it is not simply information as to single or ephemeral events in the conduct of the business, as, for example, the amount or other terms of a secret bid for a contract or the salary of certain employees, or the security investments made or contemplated, or the date fixed for the announcement of a new policy or for bringing out a new model or the like. A trade secret is a process or device for continuous use in the operations of the business. Generally it relates to the production of goods, as, for example, a machine or formula for the production of an article. It may, however, relate to the sale of goods or to other operations in the business, such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers, or a method of bookkeeping or other office management.

Secrecy. The subject matter of a trade secret must be secret. Matters of public knowledge or of general knowledge in an industry cannot be appropriated by one as his secret. Matters which are completely disclosed by the goods which one markets cannot be his secret. Substantially, a trade secret is known only in the particular business in which it is used. It is not requisite that only the proprietor of the business know it. He may, without losing his protection, communicate it to

employees involved in its use. He may likewise communicate it to others pledged to secrecy. Others may also know of it independently, as, for example, when they have discovered the process or formula by independent invention and are keeping it secret. Nevertheless, a substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring the information. An exact definition of a trade secret is not possible. Some factors to be considered in determining whether given information is one's trade secret are: (1) The extent to which the information is known outside of his business; (2) the extent to which it is known by employees and others involved in his business; (3) the extent of measures taken by him to guard the secrecy of the information; (4) the value of the information to him and his competitors; (5) the amount of effort or money expended by him in developing the information; (6) the ease or difficulty with which the information could be properly acquired or duplicated by others.

Novelty and prior art. A trade secret may be a device or process which is patentable; but it need not be that. It may be a device or process which is clearly anticipated in the prior art or one which is merely a mechanical improvement that a good mechanic can make. Novelty and invention are not requisite for a trade secret as they are for patentability. These requirements are essential to patentability because a patent protects against unlicensed use of the patented device or process even by one who discovers it properly through independent research. The patent monopoly is a reward to the inventor. But such is not the case with a trade secret. Its protection is not based on a policy of rewarding or otherwise encouraging the development of secret processes or devices. The protection is merely against breach of faith and reprehensible means of learning another's secret. For this limited protection it is not appropriate to require also the kind of novelty and invention which is a requisite of patentability. The nature of the secret is, however, an important factor in determining the kind of relief that is appropriate against one who is subject to liability under the rule stated in this section. Thus, if the secret consists of a device or process which is a novel invention, one who acquires the secret wrongfully is ordinarily enjoined from further use of it and is required to account for the profits derived from his past use. If, on the other hand, the secret consists of mechanical improvements that a good mechanic can make without resort to the secret, the wrongdoer's liability may be limited to damages, and an injunction against future use of the improvements made with the aid of the secret may be inappropriate.

[Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05427, filed 8/3/94, effective 9/12/94. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-05427, filed 4/27/87. Statutory Authority: RCW 49.17.230, 49.70.180, 49.17.040, 49.17.050 and 49.17.240. 86-12-004 (Order 86-22), § 296-62-05427, filed 5/22/86.]

WAC 296-62-05429 Appendix E—Guidelines for employer compliance (advisory). The hazard communication standard (HCS) is based on a simple concept—that employees have both a need and a right to know the hazards and identities of the chemicals they are exposed to when working. They also need to know what protective measures are available to prevent adverse effects from occurring. The

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HCS is designed to provide employees with the information they need.

Knowledge acquired under the HCS will help employers provide safer workplaces for their employees. When employers have information about the chemicals being used, they can take steps to reduce exposures, substitute less hazardous materials, and establish proper work practices. These efforts will help prevent the occurrence of work-related illnesses and injuries caused by chemicals.

The HCS addresses the issues of evaluating and communicating hazards to workers. Evaluation of chemical hazards involves a number of technical concepts, and is a process that requires the professional judgment of experienced experts. That is why the HCS is designed so that employers who simply use chemicals, rather than produce or import them, are not required to evaluate the hazards of those chemicals. Hazard determination is the responsibility of the producers and importers of the materials. Producers and importers of chemicals are then required to provide the hazard information to employers that purchase their products.

Employers that do not produce or import chemicals need only focus on those parts of the rule that deal with establishing a workplace program and communicating information to their workers. This appendix is a general guide for such employers to help them determine what is required under the rule. It does not supplant or substitute for the regulatory provisions, but rather provides a simplified outline of the steps an average employer would follow to meet those requirements.

1. Becoming Familiar With The Rule.

WISHA has provided a simple summary of the HCS in a pamphlet entitled "*Hazardous Chemicals - Right to Know - Washington Hazard Communication Standard*" WISHA Publication Number P413-014-000. Some employers prefer to begin to become familiar with the rule's requirements by reading this pamphlet. A copy may be obtained from your local WISHA office.

The standard is long, and some parts of it are technical, but the basic concepts are simple. In fact, the requirements reflect what many employers have been doing for years. You may find that you are already largely in compliance with many of the provisions, and will simply have to modify your existing programs somewhat. WISHA is an OSHA-approved state plan state, and you must comply with the state's requirements, which may be different than those of the federal rule.

The HCS requires information to be prepared and transmitted regarding all hazardous chemicals. The HCS covers both physical hazards (such as flammability), and health hazards (such as irritation, lung damage, and cancer). Most chemicals used in the workplace have some hazard potential, and thus will be covered by the rule.

One difference between this rule and many others adopted by WISHA is that this one is performance-oriented. That means that you have the flexibility to adapt the rule to the needs of your workplace, rather than having to follow specific, rigid requirements. It also means that you have to exercise more judgment to implement an appropriate and effective program.

[Title 296 WAC—p. 1413]

The standard's design is simple. Chemical manufacturers and importers must evaluate the hazards of the chemicals they produce or import. Using that information, they must then prepare labels for containers, and more detailed technical bulletins called material safety data sheets (MSDS).

Chemical manufacturers, importers, and distributors of hazardous chemicals are all required to provide the appropriate labels and material safety data sheets to the employers to which they ship the chemicals. The information is to be provided automatically. Every container of hazardous chemicals you receive must be labeled, tagged, or marked with the required information. Your suppliers must also send you a properly completed material safety data sheet (MSDS) at the time of the first shipment of the chemical, and with the next shipment after the MSDS is updated with new and significant information about the hazards.

You can rely on the information received from your suppliers. You have no independent duty to analyze the chemical or evaluate the hazards of it.

Employers that "use" hazardous chemicals must have a program to ensure the information is provided to exposed employees. "Use" means to package, handle, react, or transfer. This is an intentionally broad scope, and includes any situation where a chemical is present in such a way that employees may be exposed under normal conditions of use or in a foreseeable emergency.

The requirements of the rule that deal specifically with the hazard communication program are found in WAC 296-62-05409, Written hazard communication program; WAC 296-62-05411, Labels and other forms of warning; WAC 296-62-05413, Material safety data sheets; and WAC 296-62-05415, Employee information and training. The requirements of these paragraphs should be the focus of your attention. Concentrate on becoming familiar with them, using WAC 296-62-05403, Scope and application, and WAC 296-62-05405, Definitions applicable to this part, as references when needed to help explain the provisions.

There are two types of work operations where the coverage of the rule is limited. These are laboratories and operations where chemicals are only handled in sealed containers (e.g., a warehouse). The limited provisions for these workplaces can be found in WAC 296-62-05403, Scope and application. Basically, employers having these types of work operations need only keep labels on containers as they are received; maintain material safety data sheets that are received, and give employees access to them; and provide information and training for employees. Employers do not have to have written hazard communication programs and lists of chemicals for these types of operations. Some of these employers may have to comply with other similar standards which have requirements for a written program. For example, laboratories may be required to have a written chemical hygiene plan under WAC 296-62-400, Hazardous chemicals in laboratories.

The limited coverage of laboratories and sealed container operations addresses the obligation of an employer to the workers in the operations involved, and does not affect the employer's duties as a distributor of chemicals. For example, a distributor may have warehouse operations where employees would be protected under the limited sealed con-

tainer provisions. In this situation, requirements for obtaining and maintaining MSDSs are limited to providing access to those received with containers while the substance is in the workplace, and requesting MSDSs when employees request access for those not received with the containers. However, as a distributor of hazardous chemicals, that employer will still have responsibilities for providing MSDSs to downstream customers at the time of the first shipment and when the MSDS is updated. Therefore, although they may not be required for the employees in the work operation, the distributor may, nevertheless, have to have MSDSs to satisfy other requirements of the rule.

2. Identify Responsible Staff.

Hazard communication is going to be a continuing program in your facility. Compliance with the HCS is not a "one shot deal." In order to have a successful program, it will be necessary to assign responsibility for both the initial and ongoing activities that have to be undertaken to comply with the rule. In some cases, these activities may already be part of current job assignments. For example, site supervisors are frequently responsible for on-the-job training sessions. Early identification of the responsible employees, and involvement of them in the development of your plan of action, will result in a more effective program design. Evaluation of the effectiveness of your program will also be enhanced by involvement of affected employees.

For any safety and health program, success depends on commitment at every level of the organization. This is particularly true for hazard communication, where success requires a change in behavior. This will only occur if employers understand the program, and are committed to its success, and if employees are motivated by the people presenting the information to them.

3. Identify Hazardous Chemicals in the Workplace.

The standard requires a list of hazardous chemicals in the workplace as part of the written hazard communication program. The list will eventually serve as an inventory of everything for which an MSDS must be maintained. At this point, however, preparing the list will help you complete the rest of the program since it will give you some idea of the scope of the program required for compliance in your facility.

The best way to prepare a comprehensive list is to survey the workplace. Purchasing records may also help, and certainly employers should establish procedures to ensure that in the future purchasing procedures result in MSDSs being received before a material is used in the workplace.

The broadest possible perspective should be taken when doing the survey. Sometimes people think of "chemicals" as being only liquids in containers. The HCS covers chemicals in all physical forms—liquids, solids, gases, vapors, fumes, and mists—whether they are "contained" or not. The hazardous nature of the chemical and the potential for exposure are the factors which determine whether a chemical is covered. If it is not hazardous, it is not covered. If there is no potential for exposure (e.g., the chemical is inextricably bound and cannot be released), the rule does not cover the chemical.

Look around. Identify chemicals in containers, including pipes, but also think about chemicals generated in the work

operations. For example, welding fumes, dusts, and exhaust fumes are all sources of chemical exposures. Read labels provided by suppliers for hazard information. Make a list of all chemicals in the workplace that are potentially hazardous. For your own information and planning, you may also want to note on the list the location(s) of the products within the workplace, and an indication of the hazards as found on the label. This will help you as you prepare the rest of your program.

WAC 296-62-05403, Scope and application, includes exemptions for various chemicals or workplace situations. After compiling the complete list of chemicals, you should review paragraph (b) of this section to determine if any of the items can be eliminated from the list because they are exempted materials. For example, food, drugs, and cosmetics brought into the workplace for employee consumption are exempt. So rubbing alcohol in the first aid kit would not be covered.

Once you have compiled as complete a list as possible of the potentially hazardous chemicals in the workplace, the next step is to determine if you have received material safety data sheets for all of them. Check your files against the inventory you have just compiled. If any are missing, contact your supplier and request one. It is a good idea to document these requests, either by copy of a letter or a note regarding telephone conversations. If you have MSDSs for chemicals that are not on your list, figure out why. Maybe you do not use the chemical anymore, or maybe you missed it in your survey. Some suppliers do provide MSDSs for products that are not hazardous. These do not have to be maintained by you.

You should not allow employees to use any chemicals for which you have not received an MSDS. The MSDS provides information you need to ensure proper protective measures are implemented prior to exposure.

4. Preparing and Implementing a Hazard Communication Program.

All workplaces where employees are exposed to hazardous chemicals must have a written plan which describes how the standard will be implemented in that facility. Preparation of a plan is not just a paper exercise—all of the elements must be implemented in the workplace in order to be in compliance with the rule. See WAC 296-62-05409 for the specific requirements regarding written hazard communication programs. The only work operations which do not have to comply with the written plan requirements are laboratories and work operations where employees only handle chemicals in sealed containers. See WAC 296-62-05403, Scope and application, for the specific requirements for these two types of workplaces.

The plan does not have to be lengthy or complicated. It is intended to be a blueprint for implementation of your program—an assurance that all aspects of the requirements have been addressed.

Many trade associations and other professional groups have provided sample programs and other assistance materials to affected employers. These have been very helpful to many employers since they tend to be tailored to the particular industry involved. You may wish to investigate whether your industry trade groups have developed such materials.

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Although such general guidance may be helpful, you must remember that the written program has to reflect what you are doing in your workplace. Therefore, if you use a generic program it must be adapted to address the facility it covers. For example, the written plan must list the chemicals present at the site, indicate who is to be responsible for the various aspects of the program in your facility, and indicate where written materials will be made available to employees.

If WISHA inspects your workplace for compliance with the HCS, the WISHA compliance officer will ask to see your written plan at the outset of the inspection. In general, the following items will be considered in evaluating your program.

The written program must describe how the requirements for labels and other forms of warning, material safety data sheets, and employee information and training, are going to be met in your facility. The following discussion provides the type of information compliance officers will be looking for to decide whether these elements of the hazard communication program have been properly addressed:

A. Labels and Other Forms of Warning.

In-plant containers of hazardous chemicals must be labeled, tagged, or marked with the identity of the material and appropriate hazard warnings. Chemical manufacturers, importers, and distributors are required to ensure that every container of hazardous chemicals they ship is appropriately labeled with such information and with the name and address of the producer or other responsible party. Employers purchasing chemicals can rely on the labels provided by their suppliers. If the material is subsequently transferred by the employer from a labeled container to another container, the employer will have to label that container unless it is subject to the portable container exemption. See WAC 296-62-05411 for specific labeling requirements.

The primary information to be obtained from a WISHA-required label is an identity for the material, and appropriate hazard warnings. The identity is any term which appears on the label, the MSDS, and the list of chemicals, and thus links these three sources of information. The identity used by the supplier may be a common or trade name ("Black Magic Formula"), or a chemical name (1,1,1-trichloroethane). The hazard warning is a brief statement of the hazardous effects of the chemical ("flammable," "causes lung damage"). Labels frequently contain other information, such as precautionary measures ("do not use near open flame"), but this information is provided voluntarily and is not required by the rule. Labels must be legible, and prominently displayed. There are no specific requirements for size or color, or any specified text.

With these requirements in mind, the compliance officer will be looking for the following types of information to ensure that labeling will be properly implemented in your facility:

1. Designation of person(s) responsible for ensuring labeling of in-plant containers;
2. Designation of person(s) responsible for ensuring labeling of any shipped containers;
3. Description of labeling system(s) used;

4. Description of written alternatives to labeling of in-plant containers (if used); and

5. Procedures to review and update label information when necessary.

Employers that are purchasing and using hazardous chemicals—rather than producing or distributing them—will primarily be concerned with ensuring that every purchased container is labeled. If materials are transferred into other containers, the employer must ensure that these are labeled as well, unless they fall under the portable container exemption (WAC 296-62-05411(7)). In terms of labeling systems, you can simply choose to use the labels provided by your suppliers on the containers. These will generally be verbal text labels, and do not usually include numerical rating systems or symbols that require special training. The most important thing to remember is that this is a continuing duty—all in-plant containers of hazardous chemicals must always be labeled. Therefore, it is important to designate someone to be responsible for ensuring that the labels are maintained as required on the containers in your facility, and that newly purchased materials are checked for labels prior to use.

B. Material Safety Data Sheets.

Chemical manufacturers and importers are required to obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Distributors are responsible for ensuring that their customers are provided a copy of these MSDSs. Employers must have an MSDS for each hazardous chemical which they use. Employers may rely on the information received from their suppliers. The specific requirements for material safety data sheets are in WAC 296-62-05413.

There is no specified format for the MSDS under the rule, although there are specific information requirements. OSHA has developed a nonmandatory format, OSHA Form 174, which may be used by chemical manufacturers and importers to comply with the rule. The MSDS must be in English (although the employer may maintain copies in other languages as well). You are entitled to receive from your supplier a data sheet which includes all of the information required under the rule. If you do not receive one automatically, you should request one. If you receive one that is obviously inadequate, with, for example, blank spaces that are not completed, you should request an appropriately completed one. If your request for a data sheet or for a corrected data sheet does not produce the information needed, you should contact your local labor and industries field office for assistance in obtaining the MSDS as stated in WAC 296-62-05413(12).

The role of MSDSs under the rule is to provide detailed information on each hazardous chemical, including its potential hazardous effects, its physical and chemical characteristics, and recommendations for appropriate protective measures. This information should be useful to you as the employer responsible for designing protective programs, as well as to the workers. If you are not familiar with material safety data sheets and with chemical terminology, you may need to learn to use them yourself. A glossary of MSDS terms may be helpful in this regard. Generally speaking, most

employers using hazardous chemicals will primarily be concerned with MSDS information regarding hazardous effects and recommended protective measures. Focus on the sections of the MSDS that are applicable to your situation.

Because many MSDSs are produced in states other than Washington, there may be a difference between the permissible exposure limit (PEL) listed on the MSDS and the WISHA required PEL. For this reason WISHA will accept the OSHA PEL on the MSDS, but for training and evaluation of employee exposure, within Washington state, the WISHA PEL must be used. Most of the OSHA and WISHA PELs will be identical, but at times some will be different. For example, in April 1994, the OSHA PEL for carbon monoxide was 50 ppm for an 8 hour time-weighted average (TWA) with no short-term exposure limit (STEL) or ceiling value, but the WISHA PEL for carbon monoxide was 35 ppm for an 8 hour TWA, with a ceiling value of 200 ppm and no STEL. The current WISHA PELs are listed in WAC 296-62-075, Air contaminants.

MSDSs must be readily accessible to employees when they are in their work fields during their workshifts. This may be accomplished in many different ways. You must decide what is appropriate for your particular workplace. Some employers keep the MSDSs in a binder in a central location (e.g., in the pickup truck on a construction site). Others, particularly in workplaces with large numbers of chemicals, computerize the information and provide access through terminals. As long as employees can get the information when they need it, any approach may be used. The employees must have access to the MSDSs themselves—simply having a system where the information can be read to them over the phone is only permitted under the mobile worksite provision, WAC 296-62-05413(9) when employees must travel between workplaces during the shift. In this situation, they have access to the MSDSs prior to leaving the primary worksite, and when they return, so the telephone system is simply an emergency arrangement.

In order to ensure that you have a current MSDS for each chemical in the plant as required, and that employee access is provided, the compliance officers will be looking for the following types of information in your written program:

1. Designation of person(s) responsible for obtaining and maintaining the MSDSs;
2. How such sheets are to be maintained in the workplace (e.g., in notebooks in the work area(s) or in a computer with terminal access), and how employees can obtain access to them when they are in their work area during the work shift;
3. Procedures to follow when the MSDS is not received at the time of the first shipment;
4. For producers, procedures to update the MSDS when new and significant health information is found; and
5. Description of alternatives to actual data sheets in the workplace, if used.

For employers using hazardous chemicals, the most important aspect of the written program in terms of MSDSs is to ensure that someone is responsible for obtaining and maintaining the MSDSs for every hazardous chemical in the

workplace. The list of hazardous chemicals required to be maintained as part of the written program will serve as an inventory. As new chemicals are purchased, the list should be updated. Many companies have found it convenient to include on their purchase orders the name and address of the person designated in their company to receive MSDSs.

C. Employee Information and Training.

Each employee who may be "exposed" to hazardous chemicals when working must be provided information and trained prior to initial assignment to work with a hazardous chemical, and whenever the hazard changes. "Exposure" or "exposed" under the rule means that "an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.) and includes potential (e.g., accidental or possible) exposure." See WAC 296-62-05415 for specific requirements. Information and training may be done either by individual chemical, or by categories of hazards (such as flammability or carcinogenicity). If there are only a few chemicals in the workplace, then you may want to discuss each one individually. Where there are large numbers of chemicals, or the chemicals change frequently, you will probably want to train generally based on the hazard categories (e.g., flammable liquids, corrosive materials, carcinogens). Employees will have access to the substance-specific information on the labels and MSDSs.

Information and training is a critical part of the hazard communication program. Information regarding hazards and protective measures are provided to workers through written labels and material safety data sheets. However, through effective information and training, workers will learn to read and understand such information, determine how it can be obtained and used in their own workplaces, and understand the risks of exposure to the chemicals in their workplaces as well as the ways to protect themselves. A properly conducted training program will ensure comprehension and understanding. It is not sufficient to either just read material to the workers, or simply hand them material to read. You want to create a climate where workers feel free to ask questions. This will help you to ensure that the information is understood. You must always remember that the underlying purpose of the HCS is to reduce the incidence of chemical source illnesses and injuries. This will be accomplished by modifying behavior through the provision of hazard information and information about protective measures. If your program works, you and your workers will better understand the chemical hazards within the workplace. The procedures you establish regarding, for example, purchasing, storage, and handling of these chemicals will improve, and thereby reduce the risks posed to employees exposed to the chemical hazards involved. Furthermore, your workers' comprehension will also be increased, and proper work practices will be followed in your workplace.

If you are going to do the training yourself, you will have to understand the material and be prepared to motivate the workers to learn. This is not always an easy task, but the benefits are worth the effort. More information regarding appropriate training can be found in a booklet entitled "*Understanding Right to Know*," Publication Number P413-012-

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000. A copy may be obtained from your local labor and industries office.

In reviewing your written program with regard to information and training, the following items need to be considered:

1. Designation of person(s) responsible for conducting training;
2. Format of the program to be used (audiovisuals, classroom instruction, etc.);
3. Elements of the training program (should be consistent with the elements in WAC 296-62-05415; and
4. Procedure to train new employees at the time of their initial assignment to work with a hazardous chemical, and to train employees when a new hazard is introduced into the workplace.

The written program should provide enough details about the employer's plans in this area to assess whether or not a good faith effort is being made to train employees. WISHA does not expect that every worker will be able to recite all of the information about each chemical in the workplace. In general, the most important aspects of training under the HCS are to ensure that employees are aware that they are exposed to hazardous chemicals, that they know how to read and use labels and material safety data sheets, and that, as a consequence of learning this information, they are following the appropriate protective measures established by the employer. WISHA compliance officers will be talking to employees to determine if they have received training, if they know they are exposed to hazardous chemicals, and if they know where to obtain substance-specific information on labels and MSDSs.

The HCS does not require employers to maintain records of employee training, but many employers choose to do so. This may help you monitor your own program to ensure that all employees are appropriately trained. If you already have a training program, you may simply have to supplement it with whatever additional information is required under the HCS.

An employer can provide employees information and training through whatever means are found appropriate and protective. Although there would always have to be some training on-site (such as informing employees of the location and availability of the written program and MSDSs), employee training may be satisfied in part by general training about the requirements of the HCS and about chemical hazards on the job which is provided by, for example, trade associations, unions, colleges, and professional schools. In addition, previous training, education and experience of a worker may relieve the employer of some of the burdens of informing and training that worker. Regardless of the method relied upon, however, the employer is always ultimately responsible for ensuring that employees are adequately trained. If the compliance officer finds that the training is deficient, the employer will be cited for the deficiency regardless of who actually provided the training on behalf of the employer.

D. Other Requirements.

In addition to these specific items, compliance officers will also be asking the following questions in assessing the adequacy of the program:

Does a list of the hazardous chemicals exist in each work area or at a central location?

Are methods the employer will use to inform employees of the hazards of nonroutine tasks outlined?

Are employees informed of the hazards associated with chemicals contained in unlabeled pipes in their work areas?

On multi-employer worksites, has the employer provided other employers with information about labeling systems and precautionary measures where the other employers have employees exposed to the initial employer's chemicals?

Is the written program made available to employees and their designated representatives?

If your program adequately addresses the means of communicating information to employees in your workplace, and provides answers to the basic questions outlined above, it will be found to be in compliance with the rule.

5. Checklist for Compliance.

The following checklist will help to ensure you are in compliance with the rule:

- Obtained a copy of the rule.
- Read and understood the requirements.
- Assigned responsibility for tasks.
- Prepared an inventory of chemicals.
- Ensured containers are labeled.
- Obtained MSDS for each chemical.
- Prepared written program.
- Made MSDSs available to workers.
- Conducted training of workers.
- Established procedures to maintain current program.
- Established procedures to evaluate effectiveness.

6. Further Assistance.

If you have a question regarding compliance with the HCS, you should contact your local labor and industries field office for assistance. All field offices have industrial hygienists who can answer your questions. Free consultation services are also available to assist employers, and information regarding these services can be obtained through the field offices as well.

The telephone number for the labor and industries office closest to you should be listed in your local telephone directory. If you are not able to obtain this information, you may contact labor and industries, office of information and assistance, 1-800-4BE-SAFE for further assistance in identifying the appropriate contacts.

[Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-05429, filed 8/3/94, effective 9/12/94.]

[Title 296 WAC—p. 1418]

PART D—CONTROLS AND DEFINITIONS

WAC 296-62-060 Control requirements in addition to those specified. (1) In those cases where no acceptable standards have been derived for the control of hazardous conditions, every reasonable precaution shall be taken to safeguard the health of the worker whether provided herein or not.

(2) Preservation of records.

(a) Scope and application. This section applies to each employer who makes, maintains or has access to employee exposure records or employee medical records.

(b) Definitions.

(i) "Employee exposure record" - a record of monitoring or measuring which contains qualitative or quantitative information indicative of employee exposure to toxic materials or harmful physical agents. This includes both individual exposure records and general research or statistical studies based on information collected from exposure records.

(ii) "Employee medical record" - a record which contains information concerning the health status of an employee or employees exposed or potentially exposed to toxic materials or harmful physical agents. These records may include, but are not limited to:

(A) The results of medical examinations and tests;

(B) Any opinions or recommendations of a physician or other health professional concerning the health of an employee or employees; and

(C) Any employee medical complaints relating to workplace exposure. Employee medical records include both individual medical records and general research or statistical studies based on information collected from medical records.

(c) Preservation of records. Each employer who makes, maintains, or has access to employee exposure records or employee medical records shall preserve these records.

(d) Availability of records. The employer shall make available, upon request, to the director, department of labor and industries, or his designee, all employee exposure records and employee medical records for examination and copying.

(e) Effective date. This standard shall become effective thirty days after filing with the code reviser.

(3) Monitoring of employees. The department shall use industrial hygiene sampling methods and techniques including but not limited to personal monitoring devices and equipment approved by the director or his designee for the purpose of establishing compliance with chapter 296-62 WAC.

(a) The employer shall permit the director or his designee to monitor and evaluate any workplace or employee in accordance with all provisions of this subsection.

(b) The employer shall not prevent or discourage an employee from cooperating with the department by restricting or inhibiting his/her participation in the use of personal monitoring devices and equipment in accordance with all provisions of this subsection.

[Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 80-11-010 (Order 80-14), § 296-62-060, filed 8/8/80; Order 73-3, § 296-62-060, filed 5/7/73; Order 70-8, § 296-62-060, filed 7/31/70, effective 9/1/70; Rule 6.010, effective 8/1/63.]

(2001 Ed.)

WAC 296-62-070 Chemical agents (airborne or contact).

[Order 70-8, § 296-62-070, filed 7/31/70, effective 9/1/70; Section VII, effective 8/1/63.]

WAC 296-62-07001 Definitions (airborne chemical agents). (1) "Dust" means solid particles suspended in air, generated by handling, drilling, crushing, grinding, rapid impact, detonation, or decrepitation of organic or inorganic materials such as rock, ore, metal, coal, wood, grain, etc.

(2) "Fume" means solid particles suspended in air, generated by condensation from the gaseous state, generally after volatilization from molten metals, etc., and often accompanied by a chemical reaction such as oxidation.

(3) "Gas" means a normally formless fluid which can be changed to the liquid or solid state by the effect of increased pressure or decreased temperature or both.

(4) "Mist" means liquid droplets suspended in air, generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming or atomizing.

(5) "Vapor" means the gaseous form of a substance which is normally in the solid or liquid state.

[Order 73-3, § 296-62-07001, filed 5/7/73.]

WAC 296-62-07003 Definitions (contact chemical agents). (1) "Corrosives" means substances which in contact with living tissue cause destruction of the tissue by chemical action.

(2) "Irritants" means substances which on immediate, prolonged, or repeated contact with normal living tissue will induce a local inflammatory reaction.

(3) "Toxicants" means substances which have the inherent capacity to produce personal injury or illness to man by absorption through any body surface.

[Order 73-3, § 296-62-07003, filed 5/7/73.]

WAC 296-62-07005 Control of chemical agents. Chemical agents shall be controlled in such a manner that they will not constitute a hazard to the worker, or workers shall be protected from the hazard of contact with or exposure to chemical agents.

[Order 73-3, § 296-62-07005, filed 5/7/73.]

PART E—RESPIRATORY PROTECTION**WAC 296-62-071 Respiratory protection.**

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-071, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-071, filed 7/27/81.]

WAC 296-62-07101 To whom does chapter 296-62 WAC, Part E apply? Chapter 296-62 WAC, Part E applies to all employers covered by WISHA. Other requirements for personal protective equipment (PPE) are found in chapter 296-24 WAC, Part A-2.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07101, filed 5/4/99, effective 9/1/99. Statutory Authority:

(2001 Ed.)

RCW 49.17.040 and 49.17.050. 82-08-026 (Order 82-10), § 296-62-07101, filed 3/30/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07101, filed 7/27/81.]

Permissible Practice

WAC 296-62-07102 When are you allowed to rely on respirators to protect employees from breathing contaminated air? In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, vapors, or aerosols the goal must be to prevent atmospheric contamination. You must use, if feasible, accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, you must use respirators as required by chapter 296-62 WAC, Part E.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07102, filed 5/4/99, effective 9/1/99.]

Employer Responsibilities

WAC 296-62-07103 What are your responsibilities as an employer? (1) You must provide respirators, when necessary, to protect the health of your employees against recognized respiratory hazards including any exposures in excess of the permissible exposure limit.

(2) You must provide NIOSH-certified respirators that are applicable and suitable for the purpose intended.

(3) You must make sure your employees use respirators when required or when otherwise necessary.

(4) You must establish and maintain a written respiratory protection program that includes the requirements outlined in WAC 296-62-07111.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07103, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07103, filed 7/27/81.]

Definitions

WAC 296-62-07105 Definitions. The following definitions are important terms used in this part.

Aerosol means a suspension of liquid or solid particles in air.

Air-purifying respirator means a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

Assigned protection factor (APF) is the expected level of workplace respiratory protection provided by a properly functioning respirator worn by properly fitted and trained individuals. It describes the ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator.

Atmosphere-supplying respirator means a respirator that supplies the respirator user with breathing air from an uncontaminated source, and includes supplied-air respirators

(SARs) and self-contained breathing apparatus (SCBA) units.

Canister or cartridge (air-purifying) means a container with a filter, sorbent, or catalyst, or any combination of these materials, which removes specific contaminants from the air drawn through it.

Canister (oxygen-generating) means a container filled with a chemical that generates oxygen by chemical reaction.

Demand respirator means an atmosphere-supplying respirator that admits breathing air to the facepiece only when suction is created inside the facepiece by inhalation.

Dust means a solid, mechanically-produced particle with sizes varying from submicroscopic to visible. See WAC 296-62-07001(1).

Dust mask means a type of filtering facepiece respirator. See the definition for "filtering facepiece."

Emergency situation means any occurrence that may or does result in an uncontrolled significant release of an airborne contaminant. Causes of emergency situations include, but are not limited to, equipment failure, rupture of containers, or failure of control equipment.

Employee exposure means exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

End-of-service-life indicator (ESLI) means a system that warns the respirator user of the approach of the end of adequate respiratory protection: For example, that the sorbent is approaching saturation or is no longer effective.

Escape-only respirator means a respirator intended to be used only for emergency exit.

Filter or air-purifying element means a component used in respirators to remove solid or liquid aerosols from the air when it is breathed.

Filtering facepiece (dust mask) means a tight-fitting, half-face, negative pressure, particulate respirator having a facepiece entirely or completely composed of filter material without attached cartridges or canisters.

Fit factor means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio between the measured concentration of a substance in ambient air to its concentration inside the respirator when worn.

Fit test means the use of an accepted protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual (see also Qualitative fit test QLFT and Quantitative fit test QNFT).

Fog means a mist of sufficient concentration to perceptibly obscure vision.

Full facepiece means a respirator that covers the wearer's nose, mouth, and eyes.

Fume means a solid condensation particle of extremely small particle size, generally less than one micrometer in diameter. See WAC 296-62-07001(2).

Half facepiece means a respirator that covers the wearer's nose and mouth.

Helmet means the rigid portion of a respirator that also provides protection against impact or penetration.

High-efficiency particulate air filter (HEPA) means a filter that removes from air 99.97% or more of monodisperse dioctyl phthalate (DOP) particles having a mean particle diameter of 0.3 micrometer.

Hood means the portion of a respirator that completely covers the head and neck; may also cover portions of the shoulders and torso.

Immediately dangerous to life or health (IDLH) means an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Loose-fitting facepiece means a respiratory inlet covering that is designed to form a partial seal with the face.

Mist means a liquid condensation particle with sizes ranging from submicroscopic to visible. See WAC 296-62-07001(4).

Negative pressure respirator means a tight-fitting respirator in which the air pressure inside the facepiece is lower than the ambient air pressure outside the respirator during inhalation.

Nonroutine respirator use means wearing a respirator when carrying out a special task that occurs infrequently.

Odor threshold limit means the lowest concentration of a contaminant in air that can be detected by smell.

Oxygen deficient atmosphere means an atmosphere with an oxygen content below 19.5% by volume.

Particulate means a solid or liquid aerosol such as: Dust, fog, fume, mist, smoke, or spray.

Permissible exposure limit (PEL) means the legally established time-weighted average (TWA) concentration or ceiling concentration of a contaminant that must not be exceeded.

Physician or other licensed health care professional (PLHCP) means an individual whose legally permitted scope of practice (for example, license, registration, or certification) allows him or her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required in WAC 296-62-07150 through 296-62-07156.

Positive-pressure respirator means a respirator in which the air pressure inside the respiratory-inlet covering exceeds the ambient air pressure outside the respirator.

Powered air-purifying respirator (PAPR) means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Pressure demand respirator means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation or leakage.

Qualitative fit test (QLFT) means a pass/fail fit test that relies on the individual's response to the test agent to assess the adequacy of respirator fit for an individual.

Quantitative fit test (QNFT) means an assessment of the adequacy of respirator fit for an individual by numerically measuring the amount of leakage into the respirator.

Respirable means air that is suitable for breathing.

Respirator means a device, which may or may not be certified by NIOSH, designed to protect the wearer from breathing harmful atmospheres.

Respiratory-inlet covering means that portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or mouthpiece respirator with nose clamp.

Self-contained breathing apparatus (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life means the period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer. For example, the period of time that an air-purifying device is effective for removing a harmful substance from air when it is breathed.

Smoke means a system that includes the products of combustion, pyrolysis, or chemical reaction of substances in the form of visible and invisible solid and liquid particles and gaseous products in air. Smoke is usually of sufficient concentration to perceptibly obscure vision.

Sorbent is the material contained in a cartridge or canister that removes gases and vapors from the inhaled air.

Spray means a liquid, mechanically-produced particle with sizes generally in the visible.

Supplied-air respirator (SAR) or airline respirator means an atmosphere-supplying respirator for which the source of breathing air is drawn from a separate, stationary system or an uncontaminated environment.

Tight-fitting facepiece means a respiratory inlet covering that forms a complete seal with the face.

Time-weighted average (TWA) means the average concentration of a contaminant in air during a specific time period.

User seal check means an action conducted by the respirator user to determine if the respirator is properly seated to the face.

Valve (air or oxygen) means a device that controls the pressure, direction, or rate of flow of air or oxygen.

Window indicator means a device on a cartridge or canister that visually denotes the service life of the cartridge or canister.

You means the employer or the employer's designee except in WAC 296-62-07117(2) "Important Information About Voluntary Use of Respirators" when you refers to the employee.

Your refers to the employer or the employer's designee except in WAC 296-62-07117(2) "Important Information About Voluntary Use of Respirators" when your refers to the employee.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07105, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07105, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-07105, filed 1/18/95, effective 3/1/95; 94-15-096 (Order 94-07), § 296-62-07105, filed 7/20/94, effective 9/20/94; 93-19-142 (Order 93-04), § 296-62-07105, filed 9/22/93, effective 11/1/93; 91-24-017 (Order 91-07), § 296-62-07105, filed 11/22/91, effective 12/24/91. RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07105, filed 7/27/81.]

(2001 Ed.)

Respiratory Protection Program

WAC 296-62-07107 When is a respiratory protection program required? (1) In any workplace where respirators are necessary to protect the health of the employee or whenever you require respirator use, you must develop and implement a written respiratory protection program with worksite-specific procedures and specifications for required respirator use.

(2) Upon request, you must provide the director's representative a copy of your written respiratory protection program.

Note: OSHA's *Small Entity Compliance Guide* contains criteria for the selection of a program administrator and a sample program that meets the requirements of this paragraph. Copies of the *Small Entity Compliance Guide* will be available from the Occupational Safety and Health Administration's Office of Publications, Room N 3101, 200 Constitution Avenue, NW, Washington, DC, 20210.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07107, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-62-07107, filed 4/10/90, effective 5/25/90. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-07107, filed 1/15/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07107, filed 7/27/81.]

WAC 296-62-07109 When must you update your written respiratory protection program? The program must be updated as necessary to reflect those changes in workplace conditions that may affect respirator use.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07109, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-13-045 (Order 82-22), § 296-62-07109, filed 6/11/82; 82-03-023 (Order 82-1), § 296-62-07109, filed 1/15/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07109, filed 7/27/81.]

WAC 296-62-07111 What must be included in your written respiratory protection program? Include the following provision in your written program, as applicable:

- Procedures for selecting respirators for use in the workplace and a list identifying the proper type of respirator for each respiratory hazard (see WAC 296-62-07130 through 296-62-07133);
- Medical evaluations of employees required to use respirators (see WAC 296-62-07150 through 296-62-07156);
- Fit testing procedures for tight-fitting respirators (see WAC 296-62-07160 through 296-62-07162, and WAC 296-62-07201 through 296-62-07248, Appendices A-1, A-2, and A-3);
- Procedures for proper use of respirators in routine tasks, nonroutine tasks, reasonably foreseeable emergency and rescue situations (see WAC 296-62-07170 through 296-62-07172);
- Procedures for issuing the proper type of respirator based on the respiratory hazards for each employee;
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators (see WAC 296-62-07175 through 296-62-07179 and WAC 296-62-07253);

- Procedures to make sure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators (see WAC 296-62-07182);

- Training of employees in the respiratory hazards to which they are potentially exposed during routine, nonroutine, and unforeseeable emergency and rescue situations (see WAC 296-62-07188);

- Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance (see WAC 296-62-07188); and

- Procedures for regularly evaluating the effectiveness of the program (see WAC 296-62-07192).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07111, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07111, filed 7/27/81.]

WAC 296-62-07113 What are the requirements for a program administrator? You must designate a program administrator qualified by training or experience appropriate to the needs of your program to:

- Oversee the respiratory protection program; and
- Conduct the required evaluations of program effectiveness.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07113, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07113, filed 9/5/97, effective 11/5/97. Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-62-07113, filed 11/22/91, effective

12/24/91; 88-14-108 (Order 88-11), § 296-62-07113, filed 7/6/88. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07113, filed 7/27/81.]

WAC 296-62-07115 Who pays for the respirators, training, medical evaluations, and fit testing? When respirators are required, you must provide respirators, training, medical evaluations, and fit testing at no cost to your employees (including expenses such as wages and travel). For voluntary use, see WAC 296-62-07117(3).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07115, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-62-07115, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-07115, filed 11/30/83; 82-08-026 (Order 82-10), § 296-62-07115, filed 3/30/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07115, filed 7/27/81.]

Voluntary Use of Respirators

WAC 296-62-07117 What must you do when employees choose to wear respirators when respirators are not required? (1) You may provide respirators at the request of employees or permit employees to use their own respirators, if you determine that such respirator use will not in itself create a hazard.

(2) If you determine that any voluntary respirator use is permissible, you must provide the respirator users with the following information:

Figure 1 Important Information About Voluntary Use of Respirators

Note: "You" and "your" mean the employee in the following information.

Respirators protect against airborne contaminants when properly selected and worn. Respirator use is encouraged, even when exposure to contaminants are below the exposure limit(s), to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to you. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous contaminants (chemical & biological) does not exceed the limits set by WISHA standards. If your employer provides respirators for your voluntary use, or if you are allowed to provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and follow all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against solvent vapor or smoke (since smoke particles are much smaller than dust particles).
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

(3) No respiratory protection program is required when filtering-facepiece respirators are the only respirator used and they are used voluntarily. When any other type of respirator is used voluntarily, you must establish, implement, and pay for a written program that covers:

- Medical evaluations.
- Cleaning, storage and maintenance related program elements.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07117, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07117, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040,

49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07117, filed 7/27/81.]

Respirator Selection

WAC 296-62-07130 What must be considered when selecting any respirator? (1) You must identify and evaluate the respiratory hazard(s) in the workplace. This evaluation must reasonably estimate employee exposures to respiratory hazard(s) and identify the contaminant's chemical state and physical form. Where you cannot identify or reasonably estimate the employee exposure, you must consider the atmosphere to be IDLH.

(2) You must identify relevant factors pertaining to the workplace and respirator user that affect respirator performance and reliability.

(3) You must select and provide the appropriate respirators based on the respiratory hazards and the relevant factors related to the workplace and user.

(4) You must select a NIOSH-certified respirator. The respirator must be used in compliance with the conditions of its certification.

(5) You must select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-10-071, § 296-62-07130, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07131 What else must you consider when selecting a respirator for use in atmospheres that are not IDLH?

(1) You must provide a respirator that is adequate to protect the health of the employee and ensure compliance with all other WISHA statutory and regulatory requirements for routine, nonroutine, and reasonably foreseeable emergency and rescue situations.

(2) You must use the assigned protection factors (APFs) in Table 1 when selecting respirators.

Note: The APF values listed in Table 1 do not apply when respirator selection is specified by other applicable standards (e.g., asbestos, lead standards in chapter 296-62 WAC).

Table 1—Assigned Protection Factors

Type of Respirator	Assigned Protection Factor ^a
Air-Purifying Respirators (APRs)	
Half-facepiece ^b for: • Particulate-filter • Vapor- or gas-removing • Combination particulate-filter and vapor- or gas-removing	10
Full facepiece for: • Particulate-filter; • Vapor- or gas-removing; • Combination particulate-filter and vapor- or gas-removing	100
Powered Air-Purifying Respirators (PAPRs)	
Powered air-purifying, loose fitting facepiece	25
Powered air-purifying, half facepiece	50
Powered air-purifying, full facepiece, equipped with HEPA filters or sorbent cartridges or canisters	1000
Powered air-purifying, hood or helmet equipped with HEPA filters or sorbent cartridges or canisters	1000
Supplied-Air (Airline) Respirators	
Supplied-air, demand, half facepiece	10
Supplied-air, continuous-flow, loose fitting facepiece	25
Supplied-air, continuous-flow or pressure-demand type, half facepiece	50
Supplied-air, demand, full facepiece	100
Supplied-air, continuous-flow or pressure-demand type, full facepiece	1000
Supplied-air, continuous-flow, helmet or hood	1000
Self-Contained Breathing Apparatus (SCBAs)	
Self-contained breathing apparatus, demand-type, half facepiece ^b	10
Self-contained breathing apparatus, demand-type, full facepiece	100
Self-contained breathing apparatus, pressure-demand type, full facepiece	10,000

Combination respirators. For combination respirators (such as, airline respirators with an air-purifying filter), the type and mode of operation having the lowest respirator protection factor must be applied to the combination respirator not listed.

^a An assigned protection factor (APF) is a numeric rating given to respirators, which tells how much protection the respirator can provide. Multiplying the WISHA permissible exposure limit (PEL) for a contaminant by the respirator APF gives the maximum concentration of the contaminant for which the respirator can be used. PEL values can be found in chapter 296-62 WAC, Part H.

^b If the air contaminant causes eye irritation, the wearer of a respirator equipped with a quarter-mask or half-mask facepiece or mouthpiece and nose clamp must be permitted to use a protective goggle or to use a respirator equipped with a full facepiece. Mouthpiece and nose clamp respirators are approved by NIOSH only for escape from IDLH atmospheres.

(3) The respirator selected must be appropriate for the chemical state and physical form of the contaminant.

(4) For protection against gases and vapors, you must provide an atmosphere-supplying respirator or an air-purifying respirator, provided that:

- The respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant; or
- If there is no ESLI appropriate for the conditions in your workplace, you must implement a change schedule for canisters and cartridges that is based on objective information or data that will make sure that canisters and cartridges are changed before the end of their service life. Your respirator program must describe:
 - ◆ The information and data relied upon; and
 - ◆ The basis for the canister and cartridge change schedule; and
 - ◆ The basis for reliance on the data.

(5) For protection against particulates, you must provide:

- An atmosphere-supplying respirator; or
- An air-purifying respirator equipped with a filter certified by NIOSH under 30 CFR Part 11 as a high efficiency particulate air (HEPA) filter, or an air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR Part 84; or
- An air-purifying respirator equipped with any filter certified for particulates by NIOSH for contaminants consisting primarily of particles with mass median aerodynamic diameters (MMAD) of at least 2 micrometers; or
- For filters to be changed as required in WAC 296-62-07171(4).

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07131, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07131, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07132 What else must you consider when selecting a respirator for use in IDLH atmospheres?

(1) You must provide the following respirators for your employees to use in IDLH atmospheres:

- A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes; or
- A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.

(2) Respirators provided only for escape from IDLH atmospheres must be NIOSH-certified for escape from the atmosphere in which they will be used.

(3) All oxygen-deficient atmospheres must be considered IDLH unless you demonstrate that, under all foreseeable conditions, the oxygen concentration can be maintained within the ranges specified in Table 2 of this section (i.e., for the altitudes set out in the table). In such cases, any atmosphere-supplying respirator may be used.

Table 2 Altitudes for Oxygen Deficient Atmospheres

Altitude (ft.)	Oxygen deficient atmospheres (%O ₂) for which the employer may rely on any atmosphere-supplying respirator
Less than 3,001	16.0 - 19.5
3,001 - 4,000	16.4 - 19.5
4,001 - 5,000	17.1 - 19.5
5,001 - 6,000	17.8 - 19.5
6,001 - 8,000	19.3 - 19.5

¹ Above 8,000 feet the exception does not apply. Oxygen-enriched breathing air must be supplied above 14,000 feet.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07132, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07133 What else must you consider when selecting a respirator for emergency and rescue use?

(1) You must analyze emergency and rescue uses of respirators that may occur in each operation by carefully considering materials, equipment, processes, and personnel involved in each operation. The person who is thoroughly familiar with the particular operation must review the analysis. As part of your analysis, you must:

- Consider past occurrences requiring emergency or rescue use of respirators as well as conditions that resulted in such respirator applications;
- Consider the possible consequences of equipment or power failures, uncontrolled chemical reactions, fire, explosion, or human error; and
- Based on the above considerations, list potential hazards that may result in emergency or rescue use of respirators.

(2) Based upon the analysis, you must:

- Select the appropriate types of respirators;
- Provide an adequate number of respirators for each area where they may be needed for emergency or rescue use; and
- Maintain and store the respirators so that they are readily accessible and operational when needed.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07133, filed 5/4/99, effective 9/1/99.]

Medical Evaluations

WAC 296-62-07150 What are the general requirements for medical evaluations? Before an employee is fit tested or required to use a respirator in the workplace, you must provide a medical evaluation to determine the employee's ability to use a respirator. Medical evaluations are not required:

- When the only respirators used are filtering facepiece respirators that are used voluntarily under WAC 296-62-07117; or
- When the only respirators used are loose fitting escape-only respirators.

You may rely upon a previous employer's medical evaluation, if you can show that:

- You have been provided with a copy of the written recommendation as required in WAC 296-62-07155 from the PLHCP approving the employee to use the respirator chosen; and
- The previous working conditions, which required respirator use as detailed in WAC 296-62-07154(1), are substantially similar to yours.

Steps necessary for completing a medical evaluation:

- You identify a PLHCP (WAC 296-62-07151);
- You provide information to the PLHCP (WAC 296-62-07152);

- PLHCP reviews information and determines what additional questions, if any, to add to Part A of the questionnaire (WAC 296-62-07153(1));

- You administer the questionnaire confidentially (WAC 296-62-07153(2));

- PLHCP reviews and evaluates the questionnaire (WAC 296-62-07154);

- PLHCP completes any follow-up medical evaluations with employees (WAC 296-62-07154);

- PLHCP completes the written recommendation and sends it to the employee and you (WAC 296-62-07155 (1) and (2));

- You respond appropriately to written recommendations (WAC 296-62-07155) and maintain records (WAC 296-62-07194);

- You provide additional medical evaluations when required by your PLHCP (WAC 296-62-07156).

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07150, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07150, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07151 Who must perform medical evaluations? You must identify a physician or other licensed health care professional (PLHCP) to perform medical evaluations.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07151, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07152 What information must you provide to the PLHCP in addition to the questionnaire? You must provide the following information to the PLHCP before the PLHCP makes a recommendation concerning an employee's ability to use a respirator:

- The questionnaire found in WAC 296-62-07255, Appendix C;

- The type and weight of the respirator to be used by the employee;

- The duration and frequency of respirator use (including use for rescue and escape);

- The expected physical work effort;

- Additional protective clothing and equipment to be worn;

- Temperature and humidity extremes that may be encountered;

- A copy of your written respiratory protection program (including, but not limited to, a list of respirators as required in WAC 296-62-07111(1) and fit testing procedures as required in WAC 296-62-07111(3)); and

- A copy of chapter 296-62 WAC, Part E, Respiratory protection.

When an employee needs a subsequent medical evaluation, you do not have to provide any information previously given to the PLHCP if the information and the PLHCP remain the same.

Note: When you change your PLHCP, you must make sure that the new PLHCP obtains this information, either by providing the documents directly to the PLHCP or having the documents transferred from the former PLHCP to the new PLHCP. WISHA does not expect you to have employees medically reevaluated solely because a new PLHCP has been selected.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07152, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07153 How must the medical evaluations and the questionnaire be administered? (1) An initial evaluation must be completed. You may use the questionnaire in WAC 296-62-07255. It is not necessary to have an initial medical examination. However, an initial medical examination may be substituted for the questionnaire if it obtains the same information. Questions in Section 1 and 2 of Part A must be answered by all respirator users, while questions in Section 3 must be answered by SCBA and full facepiece respirator users. The PLHCP determines what additional questions must be used in the questionnaire from Part B in WAC 296-62-07255.

(2) The medical questionnaire and examinations must be administered confidentially during the employee's normal working hours or at a time and place convenient to the employee.

Confidentiality. The medical questionnaire must be administered in a way that makes sure that the employee understands its content. To ensure confidentiality, you must not review an employee's questionnaire at any time. This includes looking at the completed questions or any other interaction that may be considered a breach of confidentiality.

The following are different options that may be used to administer questionnaires confidentially:

- You may administer the questionnaire and arrange for employee access to a PLHCP if there are any questions. For example, you may provide employees a copy of the questionnaire, ask them to fill it out, and place it in a sealed envelope that is sent to the PLHCP.

- Your PLHCP may administer the questionnaire.

- You may hire a third party to confidentially administer the questionnaire.

(3) You must provide the employee with an opportunity to discuss the questionnaire and examination results with the PLHCP.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07153, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07154 Who must review the questionnaire and determine what, if any, follow-up evaluations are needed? You must provide for the following PLHCP evaluations.

- For the initial medical evaluation, the PLHCP must review the information obtained by the questionnaire in WAC 296-62-07255.

- The PLHCP must provide a follow-up medical evaluation for any employee who gives a positive response to any one of questions 1 through 8 in Section 2 of Part A in WAC 296-62-07255 or whose initial medical evaluation demonstrates the need for follow-up evaluation.

- The follow-up medical evaluation must include any consultations (for example, a telephone conversation to evaluate positive responses on the questionnaire), medical tests, or diagnostic procedures that the PLHCP deems necessary to make a final determination.

Note: When you replace a PLHCP, you must make sure that the new PLHCP obtains this information, either by providing the documents directly to the PLHCP or having the documents transferred from the former PLHCP to the new PLHCP. However, WISHA does not expect you to have employees medically reevaluated solely because a new PLHCP has been selected.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07154, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07155 What must be included in the PLHCP's written recommendation? (1) In determining the employee's ability to use a respirator, you must obtain a written recommendation regarding the employee's ability to use the respirator from the PLHCP. The recommendation must provide only the following information about the employee:

- Any limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator;
- The need, if any, for periodic future medical evaluations; and
- A statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation.

(2) You must provide a PAPR, if:

- The respirator is a negative pressure respirator and the PLHCP finds a medical condition that may place the employee's health at increased risk if the respirator is used;
- The PLHCP's medical evaluation finds that the employee can use such a respirator. You no longer must provide a PAPR, if a subsequent medical evaluation finds that the employee is medically able to use a negative pressure.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07155, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07155, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07156 When are future medical evaluations required? At a minimum, you must provide future medical evaluations that comply with the requirements in WAC 296-62-07151 through 296-62-07155 if:

- A PLHCP recommends that an employee be reevaluated at a set interval;
- An employee reports medical signs or symptoms related to his or her ability to use a respirator;
- A supervisor, or the respirator program administrator informs you that an employee needs to be reevaluated;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or
- A change occurs in workplace conditions (for example, physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

You may discontinue an employee's medical evaluations when the employee is no longer required to use a respirator.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07156, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07156, filed 5/4/99, effective 9/1/99.]

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Fit Testing

WAC 296-62-07160 When is fit testing required?

You must make sure that employees using a negative or positive pressure tight-fitting facepiece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT). Fit testing must occur:

- Prior to initial use of the respirator;
- Whenever a different respirator facepiece (size, style, model or make) is used;
- At least annually thereafter; and
- Whenever the employee reports to you or your PLHCP observes changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.

You may rely on a current fit test completed by a previous employer for the same employee if you obtain written documentation of the fit test and all other applicable requirements in WAC 296-62-07160 through 296-62-07162 have been satisfied.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07160, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07161 What is required when an employee finds the respirator's fit unacceptable? If after passing a qualitative fit test or a quantitative fit test, your employee subsequently notifies you or your PLHCP that the fit of the respirator is unacceptable, you must give the employee a reasonable opportunity to select a different respirator facepiece and to be retested.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07161, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07162 How must fit testing be done? (1) The fit test must be administered using WISHA-accepted quantitative or qualitative protocol. These protocols are contained in WAC 296-62-07201 through 296-62-07248 (Appendices A-1, A-2 and A-3 of this part).

(2) Qualitative fit testing may be used to fit test negative pressure air-purifying respirators only when they will be used in atmospheres where the concentration is less than 10 times the PEL. For negative pressure respirator use in concentrations equal to or greater than 10 times the PEL, quantitative fit testing must be used.

(3) If the fit factor, as determined through WISHA-accepted quantitative fit testing protocol, is equal to or greater than 100 for tight-fitting half facepieces, or equal to or greater than 500 for tight-fitting full facepieces, the employee passed the quantitative fit test for that respirator.

(4) Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators must be accomplished by performing quantitative or qualitative fit testing in the negative pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.

(a) Qualitative fit testing of these respirators must be accomplished by temporarily converting the respirator user's actual facepiece into a negative pressure respirator with

appropriate filters, or by using an identical negative pressure air-purifying respirator facepiece with the same sealing surfaces as a surrogate for the atmosphere-supplying or powered air-purifying respirator facepiece.

(b) Quantitative fit testing of these respirators must be accomplished by modifying the facepiece to allow sampling inside the facepiece in the breathing zone of the user, midway between the nose and mouth. This requirement must be accomplished by installing a permanent sampling probe onto a surrogate facepiece, or by using a sampling adapter designed to temporarily provide a means of sampling air from inside the facepiece.

(c) Any modifications to the respirator facepiece for fit testing must be completely removed, and the facepiece restored to NIOSH-approved configuration, before that facepiece can be used in the workplace.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 99-10-100, § 296-62-07162, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07162, filed 5/4/99, effective 9/1/99.]

Use of Respirators

WAC 296-62-07170 How must you prevent problems with the seal on tight-fitting facepieces? (1) You must not permit respirators with tight-fitting facepieces to be worn during fit testing and respirator use by employees who have:

- Any facial hair that is visibly projecting above the skin (stubble, moustache, sideburns, portions of a beard, low hair-line, bangs) that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or

- Any other condition that interferes with the face-to-facepiece seal or valve function.

(2) If an employee wears corrective glasses or goggles or other personal protective equipment, you must make sure that such equipment is worn in a manner that does not interfere with the seal of the facepiece.

(3) For all tight-fitting respirators, you must make sure that employees perform a user seal check each time they put on the respirator using the procedures in Appendix B-1 or procedures recommended by the respirator manufacturer that you demonstrate are as effective as those in Appendix B-1 of chapter 296-62 WAC, Part E.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07170, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07171 How do you monitor continuing effectiveness of your employees' respirators? (1) You must maintain appropriate surveillance of work area conditions and degree of employee exposure or stress.

(2) When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, you must reevaluate the continued effectiveness of the respirator.

(3) You must make sure that employees leave the respirator use area:

- To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use; or

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- If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece; or

- To replace the respirator or the filter, cartridge, or canister elements; or

- If the employee experiences severe discomfort in wearing the respirator; or

- If the employee becomes ill or experiences sensations of dizziness, nausea, weakness, breathing difficulty, coughing, sneezing, vomiting, fever, and chills.

(4) If the employee detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, you must replace or repair the respirator before allowing the employee to return to the work area.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07171, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07172 What are the standby procedures when respirators are used in IDLH situations? (1) You must provide standby employees when employees are working in IDLH atmospheres.

In certain IDLH situations, one standby employee is permitted when the IDLH atmosphere is well characterized and you can show that one employee can adequately:

- Monitor the employee(s) in the IDLH atmosphere;
- Implement communication activities; and
- Initiate rescue duties.

For all other IDLH situations, you must have at least two employees located outside the IDLH atmosphere.

(2) Visual, voice, or signal line communication must be maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.

(3) The employee(s) located outside the IDLH atmosphere must be trained and equipped to provide effective emergency rescue.

(4) You or your designee must be notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue.

(5) You or your designee, once notified, must provide necessary assistance appropriate to the situation.

(6) Standby employee(s) located outside the IDLH atmospheres must be equipped with:

(a) Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either

(b) Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or equivalent means for rescue where retrieval equipment is not required.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07172, filed 5/4/99, effective 9/1/99.]

Maintenance and Care of Respirators

WAC 296-62-07175 How must respirators be cleaned and disinfected? (1) You must provide each respirator user with a respirator that is clean, sanitary, and in good working order.

(2) You must make sure that respirators are cleaned and disinfected using the procedures in WAC 296-62-07253, Appendix B-2, or procedures recommended by the respirator manufacturer, provided that such procedures are as effective.

(3) The respirators must be cleaned and disinfected as follows:

- Respirators issued for the exclusive use of an employee must be cleaned and disinfected as often as necessary to be maintained in a sanitary condition;
- Respirators issued to more than one employee must be cleaned and disinfected before being worn by different individuals;
- Respirators maintained for emergency use must be cleaned and disinfected after each use; and
- Respirators used in fit testing and training must be cleaned and disinfected before being worn by a different employee.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07175, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07176 How must respirators be stored?

(1) You must make sure that all respirators are stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals. You must also make sure that they are packed or stored to prevent deformation of the facepiece and exhalation valve.

(2) When storing emergency respirators.

(a) You must keep respirators accessible to the work area.

(b) You must store respirators in compartments or in covers that are clearly marked as containing emergency respirators.

(c) You must store respirators in accordance with any applicable manufacturer instructions.

(d) You must provide an adequate number of respirators for each work area where they may be needed.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07176, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07177 When must respirators be inspected? You must make sure that:

• All respirators used in routine situations are inspected before each use and during cleaning;

• All respirators maintained for use in emergency situations are inspected at least monthly and in accordance with the manufacturer's recommendations, and are checked for proper function before and after each use;

• Emergency escape-only respirators are inspected before being carried into the workplace for use; and

• Self-contained breathing apparatus (SCBAs) must be inspected monthly.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07177, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07178 How must respirators be inspected and maintained? (1) You must make sure that respirator inspections include:

• A check of respirator function, tightness of connections, and the condition of the various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, and cartridges, canisters or filters; and

• A check of elastomeric parts for pliability and signs of deterioration.

(2) For self-contained breathing apparatus you must:

• Maintain air and oxygen cylinders in a fully charged state and recharge the cylinders when the pressure falls to 90% of the manufacturer's recommended pressure level; and

• Determine that the regulator and warning devices function properly.

(3) For respirators maintained for emergency use, you must:

• Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator; and

• Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information must be maintained until replaced following a subsequent certification.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07178, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07179 How must respirators be repaired and adjusted? (1) You must make sure that respirators that fail an inspection or are otherwise found to be defective are no longer used until they are repaired or adjusted properly;

(2) Repairs or adjustments to respirators must be made only by persons appropriately trained to perform such operations, who must use only the respirator manufacturer's NIOSH-approved parts designed for the respirator;

(3) Repairs must be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed; and

(4) Reducing and admission valves, regulators, and alarms must be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07179, filed 5/4/99, effective 9/1/99.]

Breathing Air Quality

WAC 296-62-07182 What are the breathing gas requirements for atmosphere-supplying respirators? (1) You must provide employees using atmosphere-supplying respirators (supplied-air and SCBA) with breathing gases of high purity.

(2) You must make sure that compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration accords with the following specifications:

• Compressed and liquid oxygen must meet the United States Pharmacopoeia requirements for medical or breathing oxygen; and

• Compressed breathing air must meet at least the requirements for Grade D breathing air described in

ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:

- ◆ Oxygen content (v/v) of 19.5-23.5%;
- ◆ Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
- ◆ Carbon monoxide (CO) content of 10 ppm or less;
- ◆ Carbon dioxide content of 1,000 ppm or less; and
- ◆ Lack of noticeable odor.

(3) You must make sure that compressed oxygen is not used in atmosphere-supplying respirators that have previously used compressed air.

(4) You must make sure that oxygen concentrations greater than 23.5% are used only in equipment designed for oxygen service or distribution.

(5) Cylinders used to supply breathing air to respirators.

(a) Cylinders must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 173 and Part 178);

(b) Cylinders of purchased breathing air must have a certificate of analysis from the supplier that the breathing air meets the requirements for Grade D breathing air; and

(c) The moisture content in the cylinder must not exceed a dew point of -50°F (-45.6°C) at 1 atmosphere pressure.

(6) Compressors used to supply breathing air to respirators.

(a) Compressors must be constructed and situated so as to prevent entry of contaminated air into the air-supply system.

(b) Compressors must minimize moisture content so that the dew point at 1 atmosphere pressure is 10°F (5.56°C) below the ambient temperature.

(c) Compressors must have suitable in-line air-purifying sorbent beds and filters to further make sure that the supplied-air is breathing air quality. Sorbent beds and filters must be maintained and replaced or refurbished periodically following the manufacturer's instructions.

(d) Compressors must have a tag containing the most recent sorbent bed and filter change date and the signature of the person authorized by the employer to perform the change. The tag must be maintained at the compressor.

(7) For compressors that are not oil-lubricated, you must make sure that carbon monoxide levels in the breathing air do not exceed 10 ppm.

(8) For oil-lubricated compressors, you must use a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply must be monitored at intervals sufficient to make sure the concentration of carbon monoxide in the breathing air does not exceed 10 ppm.

(9) You must make sure that breathing air couplings are incompatible with outlets for nonrespirable worksite air or other gas systems. Asphyxiating substances must not be introduced into breathing air lines.

(10) You must use breathing gas containers marked in accordance with the NIOSH respirator certification standard, 42 CFR Part 84.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07182, filed 5/4/99, effective 9/1/99.]

Identification of Filters, Cartridges and Canisters

WAC 296-62-07184 How must filters, cartridges and canisters be labeled? You must make sure that all filters, cartridges and canisters used in the workplace are labeled and color coded with the NIOSH approval label. The label must not be removed and must remain legible. Table 3 provides information about color coding for air-purifying respirator filters, cartridges, and canisters.

TABLE 3 — Color Coding of Respirator Filters, Cartridges and Canisters

Atmospheric Contaminants to be Protected Against	Colors Assigned*
Acid gases	White.
Hydrocyanic acid gas	White with 1/2 - inch green stripe completely around the canister near the bottom.
Chlorine gas	White with 1/2 - inch yellow stripe completely around the canister near the bottom.
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gas	Green with 1/2 - inch white stripe completely around the canister near the bottom.
Carbon monoxide	Blue.
Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor	Yellow with 1/2 - inch blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases	Brown.
Radioactive materials, excepting tritium and noble gases	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above cases or vapors	Canister color for contaminant, as designated above, with 1/2 - inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with 1/2 - inch gray stripe completely around the canister near the top.

*Gray must not be assigned as the main color for a canister designed to remove acids or vapors.

Note: Orange must be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07184, filed 5/4/99, effective 9/1/99.]

Training and Information

WAC 296-62-07186 What are the general training requirements? (1) You must provide effective training to:

- Employees required to use respirators;
- Supervisors; and
- Any person issuing respirators.

(2) The training must be done so your employees understand it.

(3) The training must be provided by qualified persons.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07186, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07188 How do you know if you adequately trained your employees? At a minimum, you must make certain that each employee can demonstrate:

- Why the respirator is necessary and how improper fit, use, or maintenance can compromise the protective effect of the respirator;
- What the respirator is capable of doing and what its limitations are;
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
- How to inspect (see WAC 296-62-07178), put on and remove, use (see WAC 296-62-07170 through 296-62-07172), and check the seals (see WAC 296-62-07251) of the respirator;
- The procedures for maintaining (see WAC 296-62-07175 through 296-62-07179, 296-62-07182(5) and 296-62-07253) and storing (see WAC 296-62-07176) of the respirator;
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and
- The general requirements of chapter 296-62 WAC, Part E.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07188, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07190 When must your employees be trained? (1) You must train employees before they are required to use a respirator in the workplace.

(2) If you are able to demonstrate that a new employee has received training within the last 12 months that addresses the elements specified in WAC 296-62-07172 and 296-62-07186, then you are not required to repeat the training provided that the employee can demonstrate knowledge of the element(s) required in WAC 296-62-07188.

(3) If you do not repeat initial training for an employee, then you must provide retraining no later than 12 months from the date of the employee's previous training.

(4) Retraining must be completed annually, and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete or incomplete;
- The employee's knowledge or use of the respirator indicates that the employee has not retained the understanding or skill as required in WAC 296-62-07188 above; or

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• Any other situation arises when retraining appears to be necessary to make sure respirators are used safely.

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07190, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07190, filed 5/4/99, effective 9/1/99.]

Program Evaluation

WAC 296-62-07192 How must you evaluate the effectiveness of your respiratory protection program? (1)

You must evaluate the workplace as necessary to make sure that the requirements of the current written program are being effectively carried out and that the program continues to be effective.

(2) Evaluation must include periodic monitoring by the supervisor to make sure respirators are properly worn.

(3) You must regularly ask employees required to use respirators their views on the program's effectiveness and use their input to identify any problems. Any problems identified must be corrected. At a minimum, you must evaluate the following factors:

- Respirator fit (including the employee's ability to use the respirator without interfering with effective workplace performance);
- Appropriate respirator selection for the hazards to which the employee is exposed;
- Proper respirator use under the workplace conditions the employee encounters; and
- Proper respirator maintenance.

(4) Medical and bioassay surveillance. When appropriate, medical surveillance, including bioassays, must be carried out to determine if employees using respirators are receiving adequate respiratory protection. A physician must determine the requirements of the surveillance program.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07192, filed 5/4/99, effective 9/1/99.]

Recordkeeping

WAC 296-62-07194 What are the recordkeeping requirements? (1) General. You must keep written records of the following:

- Written recommendations from the PLHCP;
- Fit testing;
- The respirator program; and
- Training.

(2) Access to medical records. You must make the written recommendations from the PLHCP and any other medical records you are maintaining available as required by chapter 296-62 WAC, Part B.

(3) Fit testing. You must keep a record of any qualitative and quantitative fit tests completed for each employee. The record must include:

- The name or identification of the employee tested;
- Type of fit test performed;
- Specific make, model, style, and size of respirator tested;
- Date of test; and

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- The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs.

Fit test records must be retained for respirator users until the next fit test is administered.

(4) You must keep a written copy of the current respirator program.

(5) You must keep written training records that include:

- Names of the employees trained; and
- The dates when the employees were trained.

(6) Written materials required by this part must be made available upon request for examination and copying to affected employees and to the director or the director's designee.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07194, filed 5/4/99, effective 9/1/99.]

APPENDICES

WAC 296-62-07201 Appendix A-1: General fit testing requirements for respiratory protection—Mandatory. This is a mandatory appendix to chapter 296-62 WAC, Part E, which includes WAC 296-62-07201 through 296-62-07203.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07201, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07202 What are the general requirements for fit testing? (1) You must conduct fit testing using the procedures found in appendices A-1 through A-3. The requirements in these appendices apply to all WISHA-accepted qualitative (QLFT) and quantitative (QNFT) fit test methods.

(2) You must allow your employees to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

(3) Prior to selecting a respirator, you must show your employees how to:

- Put on a respirator;
- Positioned the respirator on the face;
- Set strap tension; and
- Determine an acceptable fit.

(4) You must provide a mirror for your employees to use when evaluating the fit and positioning of the respirator. This instruction does not constitute your employees' formal training on respirator use, because it is only a review.

(5) You must inform your employees that:

- They are being asked to select the respirator that provides the most acceptable fit;
- Each respirator represents a different size and shape; and
- If fitted and used properly, each respirator will provide adequate protection.

(6) You must have your employees hold each chosen facepiece up to their face and eliminate those that obviously do not give an acceptable fit.

(7) You must note the more acceptable facepieces in case the one selected proves unacceptable. The most comfortable mask must be put on and worn at least five minutes to make sure it is comfortable. You must help your employee assess

comfort by discussing the points in subsection (8) of this section. If the employee is not familiar with using a particular respirator, have the employee put on the mask several times and adjust the straps each time to become adept at setting proper tension on the straps.

(8) You must review how to assess the comfort of a respirator by reviewing the following points with the employee and allowing the employee enough time to check the comfort of the respirator chosen:

- (a) Position of the mask on the nose;
- (b) Room for eye protection;
- (c) Room to talk;
- (d) Position of mask on face and cheeks.

(9) You must use the following criteria to determine if the respirator adequately fits each employee:

- (a) Chin properly placed;
- (b) Adequate strap tension, not overly tightened;
- (c) Fit across nose bridge;
- (d) Respirator of proper size to span distance from nose to chin;
- (e) Tendency of respirator to slip;
- (f) Self-observation in mirror to evaluate fit and respirator position.

(10) The employees must complete a user seal check. They must use either the negative and positive pressure seal checks described in WAC 296-62-07251, Appendix B-1 or those recommended by the respirator manufacturer that provide equivalent protection to the procedures in WAC 296-62-07251, Appendix B-1. Before conducting the negative and positive pressure checks, the employee must be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece must be selected and retested if the employee's respirator fails the user seal check tests.

(11) You must not conduct the fit test if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns that cross the respirator sealing surface. Any type of apparel that interferes with a satisfactory fit must be altered or removed.

(12) If the employee has difficulty in breathing during the tests, you must refer the employee to a physician or other licensed health care professional, as appropriate, to determine whether the employee can wear respirators while performing the employee's duties.

(13) If the employee finds the fit of the respirator unacceptable, you must give the employee the opportunity to select a different respirator and the employee must be retested.

- (14) Prior to starting the fit test, you must describe the:
 - Fit test to the employee;
 - Employee's responsibilities during the test procedure; and
 - Test exercises that the employee will be performing.

(15) The employee must wear the respirator at least 5 minutes before starting the fit test.

(16) When performing the fit test, you must have your employee wear any applicable safety equipment that may be worn during actual respirator use that could interfere with respirator fit.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07202, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07203 What are the fit test exercise requirements? (1) You must have your employees perform the following test exercises for all fit testing methods required in the appendices for Respiratory Protection Part E, except for the controlled negative pressure (CNP) testing. The CNP protocol contains a different fit testing exercise regimen. The employee must perform exercises, in the test environment, in the following ways:

(a) Normal breathing. In a normal standing position, without talking, the employee must breathe normally.

(b) Deep breathing. In a normal standing position, the employee must breathe slowly and deeply, taking caution so as not to hyperventilate.

(c) Turning head side to side. Standing in place, the employees must slowly turn their heads from side to side between the extreme positions on each side, holding their heads at each extreme momentarily so they can inhale at each side.

(d) Moving head up and down. Standing in place, the employees must slowly move their heads up and down, inhaling in the up position (when looking toward the ceiling).

(e) Talking. The employee must talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The employee can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

(f) Grimace. The employee must grimace by smiling or frowning (this applies only to QNFT testing; it is not performed for QLFT).

(g) Bending over. Employees must bend at their waist as if they were touching their toes. Jogging in place must be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(h) Normal breathing. Repeat exercise (a) for normal breathing.

(2) Each test exercise must be performed for one minute except for the grimace exercise, which must be performed for 15 seconds.

(3) You must question the employee about the comfort of the respirator after completing the test exercises. If the respirator has become unacceptable, you must try another model of respirator.

(4) Any adjustments during fit testing will void the test, making it necessary to begin again.

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[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07203, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07205 Appendix A-2: Qualitative fit testing (QLFT) protocols for respiratory protection—Mandatory. This is a mandatory appendix to chapter 296-62 WAC, Part E, which includes WAC 296-62-07205 through 296-62-07225.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07205, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07206 What are the general qualitative fit testing (QLFT) protocols? (1) You must make sure the person who administers QLFT is able to:

- Prepare test solutions;
- Calibrate equipment and perform tests properly;
- Recognize invalid tests; and
- Make sure that test equipment is in proper working order.

(2) You must make sure that QLFT equipment is kept clean and well maintained so it operates within the parameters for which it was designed.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07206, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07208 Isoamyl acetate protocol (a QLFT).

Note: You must equip particulate respirators with an organic vapor cartridge or canister when using the isoamyl acetate protocol for fit testing.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07208, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07209 What are the odor threshold screening procedures for isoamyl acetate (QLFT)? (1) Why use odor threshold screening?

Odor threshold screening, performed without wearing a respirator, determines if the employee tested can detect the odor of isoamyl acetate at low levels.

(2) How are the test solutions for odor threshold screening prepared?

(a) Use three 1 liter glass jars with metal lids.

(b) Use odor-free water (for example, distilled or spring water) at approximately 25°C (77°F) for preparing the solutions.

(c) Stock solution: Prepare the isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution by:

- Adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar;
- Closing the lid; and
- Shaking for 30 seconds.

A new stock solution must be prepared at least weekly.

(d) Daily test solution: Prepare the daily odor test solution in a second jar by placing 0.4 ml of the IAA stock solution into 500 ml of odor-free water using a clean dropper or pipette. Shake the solution for 30 seconds and allow it to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. The daily test solution must be used for only one day.

(e) Prepare a test blank in a third jar by adding 500 cc of odor-free water.

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(f) Clearly label and identify the daily odor test solution and test blank jar lids (for example, 1 and 2). Place the labels on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.

(g) Prepare the solutions used in the IAA odor detection test in an area separate from where the test is performed, in order to prevent olfactory (smelling) fatigue in the employee.

(3) What are the odor threshold screening procedures?

(a) Conduct the screening test in a different room from the one used for actual fit testing. The two rooms must be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.

(b) Type the following instructions on a card and place them on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

(c) If the employee is unable to correctly identify the jar containing the odor test solution, do not perform the IAA qualitative fit test.

(d) If the employee correctly identifies the jar containing the odor test solution, the employee may proceed to respirator selection and fit testing.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07209, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07210 What are the isoamyl acetate fit testing procedures (QLFT)? (1) The fit test chamber must be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the employee's head. If no drum liner is available, construct a similar chamber using plastic sheeting.

(2) Attach a small hook to the inside top center of the chamber.

(3) Equip each respirator used for the fitting and fit testing with organic vapor cartridges or offer protection against organic vapors.

(4) After selecting, putting on, and properly adjusting a respirator, the employee must wear it to the fit testing room.

(5) This room used for fit testing must be separate from the room used for odor threshold screening and respirator selection. It must be well-ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(6) A copy of the test exercises and any prepared text from which the employee is to read must be taped to the inside of the test chamber.

(7) Upon entering the test chamber, give the employee a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA.

(8) Have the employee hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equal to that generated by the paper towel method.

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(9) Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the employee; to explain the fit test, the importance of the employee's cooperation in the fit test, and the purpose for the test exercises; or to demonstrate some of the exercises.

(10) If at any time during the test, the employee detects the banana-like odor of IAA, the test is failed. The employee must quickly exit from the test chamber and leave the test area to avoid olfactory (smelling) fatigue.

(11) If the test is failed, the employee must return to the selection room and remove the respirator. The employee must:

- Repeat the odor sensitivity test;
- Select and put on another respirator;
- Return to the test area; and
- Again begin the fit test procedure described in subsections (1) through (8) of this section.

The process continues until a respirator that fits well has been found.

(12) Should the odor sensitivity test be failed, the employee must wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

(13) If the employee passes the test, the efficiency of the test procedure must be demonstrated by having the employee break the respirator face seal and take a breath before exiting the chamber.

(14) When the employee leaves the chamber, the employee must remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests.

(15) The used towels must be kept in a self-sealing plastic bag to keep the test area from being contaminated.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07210, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07212 Saccharin solution aerosol protocol (QLFT). The entire screening and testing procedure must be explained to the employee prior to conducting the screening test.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07212, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07213 What are the taste threshold screening procedures for saccharin (QLFT)? (1) Why use saccharin taste threshold screening?

The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the employee being tested can detect the taste of saccharin.

(2) What are the saccharin solution aerosol procedures?

(a) During threshold screening as well as during fit testing, the employee must wear an enclosure over the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts #FT 14 and #FT 15 combined, is adequate.

(b) The test enclosure must have a 3/4-inch (1.9 cm) hole in front of the employee's nose and mouth area to accommodate the nebulizer nozzle.

(c) Have the employee put on the test enclosure.

(d) Throughout the threshold screening test, the employee must breathe through a slightly open mouth with tongue extended.

(e) Instruct the employees to report when they detect a sweet taste.

(f) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer must be clearly marked to distinguish it from the fit test solution nebulizer.

(g) Saccharin threshold check solution. Prepare the threshold check solution by dissolving 0.83 gram of sodium saccharin USP in 100 ml of warm water. It can be prepared by putting 1 ml of the fit test solution in 100 ml of distilled water.

(h) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(i) Ten squeezes are repeated rapidly and then the employee is asked whether the saccharin can be tasted. If the employee tastes a sweet taste during the ten squeezes, the screening test is completed. The taste threshold is noted as ten regardless of the number of squeezes actually completed.

(j) If the first response is negative, ten more squeezes are repeated rapidly and the employee is again asked whether the saccharin is tasted. If the employee tastes a sweet taste during the second ten squeezes, the screening test is completed. The taste threshold is noted as twenty regardless of the number of squeezes actually completed.

(k) If the second response is negative, ten more squeezes are repeated rapidly and the employee is again asked whether the saccharin is tasted. If the employee tastes a sweet taste during the third set of ten squeezes, the screening test is completed. The taste threshold is noted as thirty regardless of the number of squeezes actually completed.

(l) Note the number of squeezes required to solicit a taste response.

(m) If the saccharin is not tasted after 30 squeezes (step k), the employee is unable to taste saccharin and must not perform the saccharin fit test.

Note: If employees eat or drink something sweet before the screening test, they may be unable to taste the weak saccharin solution.

(n) If a taste response is elicited, ask the employee to take note of the taste for reference in the fit test.

(o) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(p) The nebulizer must be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07213, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07214 What is the saccharin solution aerosol fit testing procedure (QLFT)? (1) The employee

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must not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure described in WAC 296-62-07210.

(3) Have the employee put on the enclosure while wearing the respirator selected in WAC 296-62-07202. The respirator must be properly adjusted and equipped with a particulate filter(s).

(4) Use a second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent to spray the fit test solution into the enclosure. Clearly mark this nebulizer to distinguish it from the screening test solution nebulizer.

(5) Prepare the fit test solution adding 83 grams of sodium saccharin to 100 ml of warm water.

(6) As before, the employees must breathe through a slightly open mouth with tongue extended, and report if they taste the sweet taste of saccharin.

(7) Insert the nebulizer into the hole in the front of the enclosure and spray an initial concentration of saccharin fit test solution into the enclosure.

(8) Use the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

(9) After generating the aerosol, instruct the employee to perform the exercises in WAC 296-62-07202.

(10) Replenish the aerosol concentration every 30 seconds using one half the original number of squeezes used initially (for example, 5, 10 or 15).

(11) Instruct the employees to tell you if at any time during the fit test the taste of saccharin is detected. If the employee does not detect tasting the saccharin, the test is passed.

(12) If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator must be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

(13) Since the nebulizer has a tendency to clog during use, periodically check the nebulizer to make sure that it is not clogged. If the nebulizer is clogged at the end of the test session, the test is invalid.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07214, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07217 Bitrex™ (denatonium benzoate) solution aerosol qualitative fit testing (QLFT) protocol. General information. The Bitrex™ (denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex™ is routinely used as a taste aversion agent in household liquids that children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure must be explained to the employee prior to the conduct of the screening test.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07217, filed 5/4/99, effective 9/1/99.]

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WAC 296-62-07218 What is the taste threshold screening procedure for Bitrex™ (QLFT)? (1) Why use odor threshold screening?

The Bitrex™ taste threshold screening, performed without wearing a respirator, is intended to determine whether the employee being tested can detect the taste of Bitrex™.

(2) What are the taste threshold screening procedures for Bitrex™ (QLFT)?

(a) During threshold screening as well as during fit testing, employees must wear an enclosure over the head and shoulders that is approximately 12 inches (30.5 cm) in diameter by 14 inches (35.6 cm) tall. The front portion of the enclosure must be clear from the respirator and allow free movement of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts #14 and #15 combined, is adequate.

(b) The test enclosure must have a 3/4-inch (1.9 cm) hole in front of the employee's nose and mouth area to accommodate the nebulizer nozzle.

(c) Have the employee put on the test enclosure.

(d) Throughout the threshold screening test, the employees must breathe through a slightly open mouth with tongue extended.

(e) Instruct the employees to tell you when they detect a bitter taste.

(f) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, spray the threshold check solution into the enclosure. Clearly mark this nebulizer to distinguish it from the fit test solution nebulizer.

(g) Prepare the threshold check solution by adding 13.5 milligrams of Bitrex™ to 100 ml of 5% salt (NaCl) solution in distilled water.

(h) To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then released and allowed to fully expand.

(i) Rapidly repeat an initial ten squeezes and then ask the employee if the Bitrex™ can be tasted. If the employee reports tasting the bitter taste during the ten squeezes, the screening test is completed. Note the taste threshold as ten regardless of the number of squeezes actually completed.

(j) If the first response is negative, rapidly repeat ten more squeezes and ask the employee if the Bitrex™ is tasted. If the employee reports tasting the bitter taste during the second ten squeezes, the screening test is completed. Note the taste threshold as twenty regardless of the number of squeezes actually completed.

(k) If the second response is negative, rapidly repeat ten more squeezes and ask the employee if the Bitrex™ is tasted. If the employee reports tasting the bitter taste during the third set of ten squeezes, the screening test is completed. Note the taste threshold as thirty regardless of the number of squeezes actually completed.

(l) Note the number of squeezes required to solicit a taste response.

(m) If the Bitrex™ is not tasted after 30 squeezes (step k), the employee is unable to taste Bitrex™ and must not perform the Bitrex™ fit test.

(n) If a taste response is elicited, ask the employee to take note of the taste for reference in the fit test.

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(o) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(p) The nebulizer must be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every four hours.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07218, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07219 What is the Bitrex™ solution aerosol fit testing procedure (QLFT)? (1) The employee must not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure as that described in WAC 296-62-07210.

(3) Have the employee put on the enclosure while wearing the respirator selected according to WAC 296-62-07202. The respirator must be properly adjusted and equipped with any type particulate filter(s).

(4) Use a second DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent to spray the fit test solution into the enclosure. Clearly mark this nebulizer to distinguish it from the screening test solution nebulizer.

(5) Prepare the fit test solution by adding 337.5 mg of Bitrex™ to 200 ml of a 5% salt (NaCl) solution in warm water.

(6) As before, the employees must breathe through a slightly open mouth with tongue extended.

(7) Instruct the employees to tell you when they detect the bitter taste of Bitrex™.

(8) Insert the nebulizer into the hole in the front of the enclosure. Spray an initial concentration of the fit test solution into the enclosure. Use the same number of squeezes (either 10, 20 or 30 squeezes) based on the number of squeezes required for the employee to taste the bitter tastes as noted during the screening test.

(9) After generating the aerosol, instruct the employee to perform the exercises in WAC 296-62-07203.

(10) Replenish the aerosol concentration every 30 seconds using one half the number of squeezes used initially (for example, 5, 10 or 15).

(11) Have the employees tell you if at any time during the fit test they taste the bitter taste of Bitrex™. If the employee does not detect tasting the Bitrex™, the test is passed.

(12) If the taste of Bitrex™ is tasted, the fit is deemed unsatisfactory and the test is failed. A different respirator must be tried and the entire test procedures must be repeated (taste threshold screening and fit testing).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07219, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07222 Irritant smoke (stannic chloride) protocol (QLFT). This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07222, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07223 What are the general requirements and precautions for irritant smoke fit testing (QLFT)?

(1) The respirator to be tested must be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).

(2) Use only stannic chloride smoke tubes for this protocol.

(3) Do not use any form of a test enclosure or hood.

(4) The smoke can be irritating to the eyes, lungs, and nasal passages. Take precautions to minimize the employee's exposure to irritant smoke. Sensitivity varies, and certain employees may respond to a greater degree to irritant smoke. Care must be taken when performing the sensitivity screening checks to use only the minimum amount of smoke necessary to elicit a response from the employee. Sensitivity screening checks determine whether the employee can detect the irritant smoke.

(5) The fit test must be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07223, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07224 What is the sensitivity screening check protocol for irritant smoke (QLFT)? (1) Why use irritant smoke sensitivity screening checks?

Employees must be tested to see if they can detect a weak concentration of the irritant smoke.

(2) What are the sensitivity screening check procedures?

(a) Break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb.

(b) Cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

(c) Advise the employees that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct them to keep their eyes closed while the test is performed.

(d) Allow the employee to smell a weak concentration of the irritant smoke before putting on a respirator to become familiar with its irritating properties and determine if they can detect the irritating properties of the smoke.

(e) Carefully direct a small amount of the irritant smoke toward the employees being tested to see if they can detect it.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07224, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07225 What is the irritant smoke fit testing procedure (QLFT)? (1) Have the employee put on the respirator without assistance, and perform the required user seal check(s).

(2) Instruct the employees to keep their eyes closed.

(3) Direct the stream of irritant smoke from the smoke tube toward the face seal area of the employee, using the low flow pump or the squeeze bulb. Begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. Gradually make two more passes

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around the perimeter of the mask, moving to within six inches of the respirator.

(4) If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.

(5) Have the employee perform the exercises required in WAC 296-62-07203 while the respirator seal is being continually challenged by the smoke. Direct the smoke around the perimeter of the respirator at a distance of six inches.

(6) If the employee being fit tested detects the irritant smoke at any time, the test is failed. An employee being retested must repeat the entire sensitivity check and fit test procedures.

(7) Have the employee remove the respirator.

(8) Give employees passing the irritant smoke test without evidence of a response (involuntary cough, irritation) a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test to determine if they still react to the smoke. The fit test is void if an employee does not respond to the smoke.

(9) If the employee responds to the second sensitivity check, then the fit test is passed.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07225, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07230 Appendix A-3: Quantitative fit testing (QNFT) protocols for respiratory protection—Mandatory. This is a mandatory appendix to chapter 296-62 WAC, Part E, which includes WAC 296-62-07230 through 296-62-07248.

The following quantitative fit testing procedures are acceptable protocols:

- Nonhazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator;
- Ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit;
- Controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07230, filed 5/4/99, effective 9/1/99.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-62-07231 What are the general requirements for quantitative fit testing (QNFT)? (1) You must make sure that persons administering QNFT are able to:

- Calibrate equipment and perform tests properly;
- Recognize invalid tests;
- Calculate fit factors properly; and
- Make sure that test equipment is in proper working order.

(2) You must make sure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

(2001 Ed.)

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07231, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07233 Generated aerosol quantitative fit testing protocol (QNFT).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07233, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07234 What equipment is required for generated aerosol fit testing (QNFT)? (1) Instrumentation. Use aerosol generation, dilution, and measurement systems using particulates (corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS] or sodium chloride) as test aerosols for quantitative fit testing.

(2) Test chamber.

(a) The test chamber must be large enough to permit all employees to perform freely all required exercises without disturbing the test agent concentration or the measurement apparatus.

(b) The test chamber must be equipped and constructed so that the test agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(3) When testing air-purifying respirators, replace the normal filter or cartridge element with a high efficiency particulate air (HEPA) or P100 series filter supplied by the same manufacturer.

(4) Select the sampling instrument so that a computer record or strip chart record may be made of the test showing the rise and fall of the test agent concentration with each inspiration and expiration at fit factors of at least 2,000. Integrators or computers that integrate the amount of test agent penetration leakage into the respirator for each exercise may be used provided a record of the readings is made.

(5) Do not expose the employee to any combination of substitute air-purifying elements, test agent and test agent concentration in excess of an established exposure limit for the test agent at any time during the testing process. Base the employee's exposure on the length of the exposure and the exposure limit duration.

(6) Construct the sampling port and place it on the test specimen respirator so that:

- No leaks occurs around the port (for example, where the respirator is probed);
- A free air flow is allowed into the sampling line at all times; and
- There is no interference with the fit or performance of the respirator.

The in-mask sampling device (probe) must be designed and used so that the air sample is drawn from the breathing zone of the employee, midway between the nose and mouth and with the probe extending into the facepiece cavity at least 1/4-inch.

(7) The person administering the fit test must be able to observe the employee inside the chamber during the test.

(8) The equipment generating the test atmosphere must maintain the concentration of test agent constant to within a 10 percent variation for the duration of the test.

(9) Keep the time lag (interval between an event and the recording of the event on the strip chart or computer or integrator) to a minimum. You must be able to clearly see when

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an event occurs and when it is recorded on the strip chart or computer.

(10) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port must be:

- Equal in diameter;
- Made of the same material; and
- Equal in length.

(11) The exhaust flow from the test chamber must pass through an appropriate filter (i.e., high efficiency particulate filter) before release.

(12) When sodium chloride aerosol is used, the relative humidity inside the test chamber must not exceed 50 percent.

(13) Take into account the limitations of instrument detection when determining the fit factor.

(14) Test respirators must be maintained in proper working order and be inspected regularly for deficiencies such as cracks or missing valves and gaskets.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07234, filed 5/4/99, effective 9/1/99.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-62-07235 What are the procedures for generated aerosol quantitative fit testing (QNFT)? (1) When performing the initial user seal check using a positive or negative pressure check, crimp the sampling line in order to avoid air pressure leakage during either of these pressure checks.

(2) Using an abbreviated screening QLFT test is optional. You may use a QLFT screening test to quickly identify poor fitting respirators that passed the positive and/or negative pressure test and reduce the amount of QNFT time. Another option is to use the CNC QNFT instrument in the count mode to obtain a quick estimate of fit and eliminate poor fitting respirators before going on to perform a full QNFT.

(3) A reasonably stable test agent concentration must be measured in the test chamber prior to testing. For canopy or shower curtain types of test units, determine the test agent's stability after the employee has entered the test environment.

(4) Immediately after the employee enters the test chamber, measure the test agent concentration inside the respirator to make sure that the peak penetration does not exceed 5 percent for a half-mask or 1 percent for a full facepiece respirator.

(5) Obtain a stable test agent concentration prior to the actual start of testing.

(6) Do not over-tighten respirator restraining straps for testing. Have the employee adjust the straps, without assistance, to give a reasonably comfortable fit typical of normal use.

(7) Do not adjust the respirator once the fit test exercises begin.

(8) Stop the test whenever any single peak penetration exceeds 5 percent for half-masks and 1 percent for full facepiece respirators. The employee must be refitted and retested.

(9) Do not permit the employee to wear a half-mask or quarter facepiece respirator unless:

- A minimum fit factor of 100 is obtained; or

- A full facepiece respirator unless a minimum fit factor of 500 is obtained.

(10) Filters used for quantitative fit testing must be replaced whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07235, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07236 How are fit factors calculated (QNFT)? (1) Determine the fit factor for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration measured inside the respirator for each test exercise except the grimace exercise.

(2) Calculate the average test chamber concentration using one of the following:

- Arithmetic average of the concentration measured before and after each test (i.e., 7 exercises); or
- Arithmetic average of the concentration measured before and after each exercise; or
- True average measured continuously during the respirator sample.

(3) Determine the concentration of the challenge agent inside the respirator by one of the following methods:

(a) Average peak penetration method. Average peak penetration method determines how much test agent penetrates into the respirator using a strip chart recorder, integrator, or computer. Determine the agent penetration averaging the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers that calculate the actual test agent penetration into the respirator for each exercise also will meet the requirements of the average peak penetration method.

(b) Maximum peak penetration. Maximum peak penetration method determines how much test agent penetrates into the respirator using a strip chart recordings of the test. The highest peak penetration for a given exercise represents the average penetration into the respirator for that exercise.

(c) Area under the peaks. Integrate the area under the individual peak for each exercise except the grimace exercise using computerized integration or other appropriate calculations.

(d) Overall fit factor. Calculate the overall fit factor using individual exercise fit factors.

- Convert the exercise fit factors to the penetration values.
- Determine the average.
- Then convert the average result back to a fit factor.

Use the following equation to calculate overall fit factor:

$$\text{Overall Fit Factor} = \frac{\text{Number of exercises}}{1/ff_1 + 1/ff_2 + 1/ff_3 + 1/ff_4 + 1/ff_5 + 1/ff_6 + 1/ff_7 + 1/ff_8}$$

Where $ff_1, ff_2, ff_3, \text{ etc.}$ are the fit factors for exercises 1, 2, 3, etc.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07236, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07238 Ambient aerosol condensation nuclei counter (CNC) quantitative fit testing protocol.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07238, filed 5/4/99, effective 9/1/99.]

[Title 296 WAC—p. 1438]

WAC 296-62-07239 General information about ambient aerosol condensation nuclei counter (CNC) protocol (QNFT). (1) The ambient aerosol condensation nuclei counter (CNC) quantitative fit testing (Portacount™) protocol uses a probe to quantitatively fit tests respirators. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask.

(2) The probed respirator is only used for quantitative fit tests.

(3) A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor.

(4) The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07239, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07240 What are the general requirements for ambient aerosol condensation nuclei counter (CNC) protocol (QNFT)? (1) A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator.

(2) A minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator.

(3) The entire screening and testing procedure must be explained to the employee prior to the conduct of the screening test.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07240, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07242 What are the Portacount fit testing procedures? (1) Check the respirator to make sure the:

- Sampling probe and line are properly attached to the facepiece; and
- Respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (for example, NIOSH 42 CFR 82 series 100, series 99, or series 95 particulate filter) per manufacturer's instruction.

(2) Instruct the employee to put on the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the employee to make certain the respirator is comfortable. Before fit testing, train the employee on how to wear the respirator properly.

(3) Check the following conditions for the adequacy of the respirator fit:

- Chin properly placed;
- Adequate strap tension, not overly tightened;
- Fit across nose bridge;
- Respirator of proper size to span distance from nose to chin;
- Tendency of the respirator to slip;
- Self-observation in a mirror to evaluate fit and respirator position.

(4) Have the employee do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.

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(5) Follow the manufacturer's instructions for operating the Portacount and begin the test.

(6) Have the employee perform the exercises in WAC 296-62-07203.

(7) After the test exercises, ask the employee about comfort of the respirator. If the respirator is unacceptable, try another model of respirator.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07242, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07243 How is the Portacount test instrument used? (1) The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The pass or fail message will indicate whether or not the test was successful. If the test was a pass, the fit test is over.

(2) Since the pass or fail criterion of the Portacount is user programmable, you must make sure that the pass or fail criterion meets the requirements for minimum respirator performance in WAC 296-62-07235.

(3) Keep a record of successful fit tests on file. The record must contain:

- The employee's name;
- Overall fit factor;
- Make, model, style, and size of respirator used; and
- Date tested.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07243, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07245 Controlled negative pressure (CNP) quantitative fit testing protocol (QNFT). The CNP protocol provides an alternative to aerosol fit test methods.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07245, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07246 How does controlled negative pressure (CNP) fit testing work (QNFT)? (1) The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator.

(2) The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators.

(3) Manufacturer attachments. The CNP instrument manufacturer Dynatech Nevada also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator.

(4) Performing the test. To perform the test, the employees close their mouths and hold their breath, after which an

air pump removes air from the respirator facepiece at a preselected constant pressure.

(5) Facepiece fit. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute.

(6) The quality and validity of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07246, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07247 What are the controlled negative pressure (CNP) fit testing requirements and procedures (QNFT)? (1) Fit factor.

- A minimum fit factor pass level of 100 is necessary for a half-mask respirator.
- A minimum fit factor of at least 500 is required for a full facepiece respirator.

(2) The entire screening and testing procedure must be explained to the employee prior to the conduct of the screening test.

(3) The instrument must have a nonadjustable test pressure of 15.0 mm water pressure.

(4) When performing fit tests, set the CNP system defaults at:

- 15 mm of water (-0.58 inches of water) test pressure and
- 53.8 liters per minute for the modeled inspiratory flow rate.

Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.

(5) The person conducting the CNP fit testing must be thoroughly trained to perform the test.

(6) Replace the respirator filter or cartridge with the CNP test manifold. Temporarily remove or prop open the inhalation valve downstream from the manifold.

(7) Train employees to hold their breath for at least 20 seconds.

(8) Have the employee put on the test respirator without any assistance from the individual who conducts the CNP fit test.

(9) The QNFT protocol must be followed according to WAC 296-62-07231 with an exception for the CNP test.

(10) The test instrument must have an effective audio warning device when the employee fails to hold his or her breath during the test.

(11) Stop the test whenever the employees fail to hold their breath. The employees must be refitted and retested.

(12) A record of the test must be kept on file, assuming the fit test was successful. The record must contain the employee's name; overall fit factor; make, model, style and size of respirator used; and date tested.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07247, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07248 What test exercises are required for controlled negative pressure (CNP) fit testing (QNFT)? (1) Normal breathing. In a normal standing position, without talking, the employees must breathe normally for 1 minute. After the normal breathing exercise, the employees must hold their head straight ahead and hold their breath for 10 seconds during the test measurement.

(2) Deep breathing. In a normal standing position, the employees must breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the employees must hold their head straight ahead and hold their breath for 10 seconds during test measurement.

(3) Turning head side to side.

- Standing in place, the employees must slowly turn their heads from side to side between the extreme positions on each side for 1 minute, holding their heads each extreme momentarily so they can inhale at each side.
- After the turning head side to side exercise, have the employees hold their heads full left and hold their breath for 10 seconds during test measurement.
- Next, have the employees need to hold their head full right and hold their breath for 10 seconds during test measurement.

(4) Moving head up and down.

- Standing in place, the employees must slowly move their heads up and down for 1 minute.
- Instruct the employee to inhale in the up position (when looking toward the ceiling).
- After the moving head up and down exercise, the employees must hold their heads full up and hold their breath for 10 seconds during test measurement.
- Next, the employees must hold their heads full down and hold their breath for 10 seconds during test measurement.

(5) Talking. The employee must talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The employee can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the employee must hold his or her head straight ahead and hold his or her breath for 10 seconds during the test measurement.

(6) Grimace. The employee must grimace by smiling or frowning for 15 seconds.

(7) Bending over. Employees must bend at the waist as if they were touching their toes for 1 minute. Jogging in place must be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the employees must hold their head straight ahead and hold their breath for 10 seconds during the test measurement.

(8) Normal breathing.

- The employee must remove and put on the respirator again within a one-minute period.
- Then, in a normal standing position, without talking, the employee must breathe normally for 1 minute.
- After the normal breathing exercise, the employee must hold his or her head straight ahead and hold his

or her breath for 10 seconds during the test measurement.

(9) After the test exercises, question the employee about the comfort of the respirator. If the respirator has become unacceptable, another model of a respirator must be tried.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07248, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07251 Appendix B-1: User seal check procedures—Mandatory. This is a mandatory appendix to chapter 296-62 WAC, Part E.

The individual who uses a tight-fitting respirator must perform a user seal check to make sure that the respirator makes an adequate seal each time it is put on. Either the positive and negative pressure checks listed in this appendix, or the respirator manufacturer's recommended user seal check method must be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

(1) Facepiece positive and/or negative pressure checks.

(a) Positive pressure check. Close off the exhalation valve and exhale gently into the facepiece. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve. The face fit is considered adequate if a slight positive pressure (inflation) can be built up inside the facepiece without any evidence of outward leakage of air at the seal. Carefully replace the exhalation valve cover, if it was removed, after the test.

(b) Negative pressure check. Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. If the design of the inlet opening of the cartridges cannot be effectively covered with the palm of the hand, cover the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

(2) Manufacturer's recommended user seal check procedures. The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures describe above provided that you demonstrate that the manufacturer's procedures are equally effective.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07251, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07253 Appendix B-2: Respirator cleaning procedures—Mandatory. This is a mandatory appendix to chapter 296-62 WAC, Part E.

(1) These procedures are provided for you to use when cleaning respirators. They are general in nature, and as an alternative you may use the cleaning recommendations provided by the manufacturer of the respirators used by your employees, if the manufacturer's procedures are as effective as those listed here in Appendix B-2. Procedures are as effective when they meet the requirements in Appendix B-2, i.e., that must make sure that the respirator is properly cleaned and disinfected so that the respirator is not damaged and does no harm to the user.

(2) Procedures for cleaning respirators.

(a) Remove filters, cartridges, or canisters. Remove speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

(b) Wash components in warm (43°C [110°F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

(c) Rinse components thoroughly in clean, warm (43°C [110°F] maximum), preferably running water. Drain.

(d) When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

(i) Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43°C (110°F); or,

(ii) Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43°C (110°F); or,

(iii) Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

(e) Rinse components thoroughly in clean, warm (43°C [110°F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

(f) Components should be hand-dried with a clean lint-free cloth or air-dried.

(g) Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.

(h) Test the respirator to make sure that all components work properly.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07253, filed 5/4/99, effective 9/1/99.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-62-07255 Appendix C: WISHA respirator medical evaluation questionnaire—Mandatory. This is a mandatory appendix to chapter 296-62 WAC, Part E.

To the employer:

You must not review employee questionnaires.

To the employer's PLHCP:

Answers to questions in Section 1 and question 9 in Section 2 of Part A do not require further medical evaluations.

To the employee:

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or

send this questionnaire to the health care professional who will review it.

Part A. Section 1. Mandatory

The following information must be provided by every employee who has been selected to use any type of respirator (please print).

1. Today's date: _____
2. Your name: _____
3. Your age (to nearest year): _____
4. Sex (circle one): Male/Female
5. Your height: _____ ft. in.
6. Your weight: _____ lbs.
7. Your job title: _____
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): _____
9. The best time to phone you at this number: _____
10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes/No
11. Check the type of respirator you will use (you can check more than one category):
 - a. N, R, or P filtering facepiece respirator (dust mask style, half facepiece respirators without cartridges).
 - b. Check all that apply.
 - Half mask Full facepiece Helmet hood Escape mask
 - Nonpowered cartridge or canister
 - Powered air-purifying cartridge respirator (PAPR)
 - Supplied-air or Air-line
 - Self contained breathing apparatus Demand or Pressure demand (SCBA):
 - Other: _____
12. Have you worn a respirator (circle one): Yes/No
If "yes," what type(s): _____

Part A. Section 2. Mandatory

Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you *currently* smoke tobacco, or have you smoked tobacco in the last month: Yes/No
2. Have you *ever had* any of the following conditions?
 - a. Seizures (fits): Yes/No
 - b. Diabetes (sugar disease): Yes/No
 - c. Allergic reactions that interfere with your breathing: Yes/No
 - d. Claustrophobia (fear of closed-in places): Yes/No
 - e. Trouble smelling odors: Yes/No
3. Have you *ever had* any of the following pulmonary or lung problems?
 - a. Asbestosis: Yes/No
 - b. Asthma: Yes/No
 - c. Chronic bronchitis: Yes/No

- d. Emphysema: Yes/No
- e. Pneumonia: Yes/No
- f. Tuberculosis: Yes/No
- g. Silicosis: Yes/No
- h. Pneumothorax (collapsed lung): Yes/No
- i. Lung cancer: Yes/No
- j. Broken ribs: Yes/No
- k. Any chest injuries or surgeries: Yes/No
- l. Any other lung problem that you've been told about: Yes/No

4. Do you *currently* have any of the following symptoms of pulmonary or lung illness?

- a. Shortness of breath: Yes/No
- b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No
- c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No
- d. Have to stop for breath when walking at your own pace on level ground: Yes/No
- e. Shortness of breath when washing or dressing yourself: Yes/No
- f. Shortness of breath that interferes with your job: Yes/No
- g. Coughing that produces phlegm (thick sputum): Yes/No
- h. Coughing that wakes you early in the morning: Yes/No
- i. Coughing that occurs mostly when you are lying down: Yes/No
- j. Coughing up blood in the last month: Yes/No
- k. Wheezing: Yes/No
- l. Wheezing that interferes with your job: Yes/No
- m. Chest pain when you breathe deeply: Yes/No
- n. Any other symptoms that you think may be related to lung problems: Yes/No

5. Have you *ever had* any of the following cardiovascular or heart problems?

- a. Heart attack: Yes/No
- b. Stroke: Yes/No
- c. Angina: Yes/No
- d. Heart failure: Yes/No
- e. Swelling in your legs or feet (not caused by walking): Yes/No
- f. Heart arrhythmia (heart beating irregularly): Yes/No
- g. High blood pressure: Yes/No
- h. Any other heart problem that you've been told about: Yes/No

6. Have you *ever had* any of the following cardiovascular or heart symptoms?

- a. Frequent pain or tightness in your chest: Yes/No
- b. Pain or tightness in your chest during physical activity: Yes/No
- c. Pain or tightness in your chest that interferes with your job: Yes/No
- d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
- e. Heartburn or indigestion that is not related to eating: Yes/No
- f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No

7. Do you *currently* take medication for any of the following problems?

- a. Breathing or lung problems: Yes/No
- b. Heart trouble: Yes/No
- c. Blood pressure: Yes/No
- d. Seizures (fits): Yes/No

8. If you've used a respirator, have you *ever had* any of the following problems? (If you've never used a respirator, check the following space and go to question 9:)

- a. Eye irritation: Yes/No
- b. Skin allergies or rashes: Yes/No
- c. Anxiety: Yes/No
- d. General weakness or fatigue: Yes/No
- e. Any other problem that interferes with your use of a respirator: Yes/No

9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No

Part A. Section 3. Mandatory for SCBA or Full Facepiece Respirator Users

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10. Have you *ever lost* vision in either eye (temporarily or permanently): Yes/No

11. Do you *currently* have any of the following vision problems?

- a. Wear contact lenses: Yes/No
- b. Wear glasses: Yes/No
- c. Color blind: Yes/No
- d. Any other eye or vision problem: Yes/No

12. Have you *ever had* an injury to your ears, including a broken ear drum: Yes/No

13. Do you *currently* have any of the following hearing problems?

- a. Difficulty hearing: Yes/No
- b. Wear a hearing aid: Yes/No
- c. Any other hearing or ear problem: Yes/No

14. Have you *ever had* a back injury: Yes/No

15. Do you *currently* have any of the following musculoskeletal problems?

- a. Weakness in any of your arms, hands, legs, or feet: Yes/No
- b. Back pain: Yes/No
- c. Difficulty fully moving your arms and legs: Yes/No
- d. Pain or stiffness when you lean forward or backward at the waist: Yes/No
- e. Difficulty fully moving your head up or down: Yes/No
- f. Difficulty fully moving your head side to side: Yes/No
- g. Difficulty bending at your knees: Yes/No
- h. Difficulty squatting to the ground: Yes/No
- i. Climbing a flight of stairs or a ladder carrying more than 25 lbs: Yes/No

j. Any other muscle or skeletal problem that interferes with using a respirator: Yes/No

Part B: PLHCP Discretionary Questions

If appropriate to specific job requirements or conditions, additional questions - including but not limited to the following - may be added at the discretion of the health care professional to clarify an employee's ability to use a respirator.

1. In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen: Yes/No

If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions: Yes/No

2. At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (for example, gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: Yes/No

If "yes," name the chemicals if you know them: _____

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:

- a. Asbestos: Yes/No
b. Silica (for example, in sandblasting): Yes/No
c. Tungsten/cobalt (for example, grinding or welding this material): Yes/No
d. Beryllium: Yes/No
e. Aluminum: Yes/No
f. Coal (for example, mining): Yes/No
g. Iron: Yes/No
h. Tin: Yes/No
i. Dusty environments: Yes/No
j. Any other hazardous exposures: Yes/No

If "yes," describe these exposures: _____

4. List any second jobs or side businesses you have: _____

5. List your previous occupations: _____

6. List your current and previous hobbies: _____

7. Have you been in the military services? Yes/No
If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No

8. Have you ever worked on a HAZMAT team? Yes/No

9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier

in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No

If "yes," name the medications if you know them: _____

10. Will you be using any of the following items with your respirator(s)?

- a. HEPA Filters: Yes/No
b. Canisters (for example, gas masks): Yes/No
c. Cartridges: Yes/No

11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you)?:

- a. Escape only (no rescue): Yes/No
b. Emergency rescue only: Yes/No
c. Less than 5 hours per week: Yes/No
d. Less than 2 hours per day: Yes/No
e. 2 to 4 hours per day: Yes/No
f. Over 4 hours per day: Yes/No

12. During the period you are using the respirator(s), is your work effort:

- a. Light (less than 200 kcal per hour): Yes/No

If "yes," how long does this period last during the average shift: _____ hrs. _____ mins.

Examples of a light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.

- b. Moderate (200 to 350 kcal per hour): Yes/No

If "yes," how long does this period last during the average shift: _____ hrs. _____ mins.

Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5-degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.

- c. Heavy (above 350 kcal per hour): Yes/No

If "yes," how long does this period last during the average shift: _____ hrs. _____ mins.

Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8-degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).

13. Will you be wearing protective clothing and/or equipment (other than the respirator) when you're using your respirator: Yes/No

If "yes," describe this protective clothing and/or equipment: _____

14. Will you be working under hot conditions (temperature exceeding 77°F): Yes/No

15. Will you be working under humid conditions: Yes/No

16. Describe the work you'll be doing while you're using your respirator(s):

17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):

18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):

Name of the first toxic substance:
Estimated maximum exposure level per shift:
Duration of exposure per shift:

Name of the second toxic substance:
Estimated maximum exposure level per shift:
Duration of exposure per shift:

Name of the third toxic substance:
Estimated maximum exposure level per shift:
Duration of exposure per shift:

The name of any other toxic substances that you'll be exposed to while using your respirator:

19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):

[Statutory Authority: RCW 49.17.010, [49.17].040, and [49.17].050. 00-21-100, § 296-62-07255, filed 10/18/00, effective 1/1/01; 99-10-071, § 296-62-07255, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07257 Appendix D: Health care provider respirator recommendation form—Nonmandatory. This is a nonmandatory appendix to chapter 296-62 WAC, Part E.

This form is for the use of PLHCPs who are providing recommendations to employers regarding employee clearance for respirator use. Completion of this form satisfies the requirement for PLHCP's recommendations as detailed in WAC 296-62-07155. The following information is purposely limited in order to maintain employee confidentiality.

Form with fields for Employee Name, Employer Name, Address, Phone, Health Care Professional Name, and Address.

Type of Respirator This Individual is Medically Cleared to Use
Check all that apply.
[] Half-mask [] Full facepiece [] Helmet Hood [] Escape mask

- [] Non-powered cartridge or canister [] Powered air-purifying cartridge respirator (PAPR)
[] Supplied-air or Air-line [] Disposable filtering facepiece (for example N-95)

Self contained breathing apparatus (SCBA):
[] Demand or [] Pressure demand
Other: _____

Respirator Clearance
Under the conditions described in the supplemental information provided by the employer, this individual: (please check one)
_____ is medically cleared for use of the respirator(s) without limitations.
_____ is medically cleared for use of the respirator(s) with the following limitations:
_____ is not medically cleared for use of a respirator.

Workload Limitations
[] unrestricted [] heavy [] medium [] light

Follow-up Medical Evaluations
This individual will/will not (circle one) require additional follow-up medical evaluation(s). The recommended schedule for follow-up medical evaluations, if necessary, is as follows:

Employee Notification
I certify that the above named individual for whom this respirator clearance form is provided has received a copy of this recommendation.

Signature _____ Date _____
(Physician or other Licensed Health Care Professional)

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07257, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07260 Appendix E: Additional information regarding respirator selection—Nonmandatory. This is a nonmandatory appendix to chapter 296-62 WAC, Part E, which includes WAC 296-62-07260 through 296-62-07295.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07260, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07261 How do you classify respiratory hazards? Respiratory hazards are classified into the following categories:

- Oxygen deficient;
• Physical properties (gas, vapor, biological aerosols, and particulate contaminants, which include dust, fog, fume, mist, smoke, and spray);
• Physiological effects on the body (for example, asphyxiant, carcinogenic, or toxic);
• Concentration of toxic material or radioactivity level;
• Established exposure limits; and
• Established immediately dangerous to life or health concentrations.

When selecting a respirator, you must determine which of the categories listed above apply to your workplace.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07261, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07263 What are oxygen deficient respiratory hazards? (1) The oxygen content of normal air at sea-level conditions is 20.9%.

(2) Minimum legal requirements: An oxygen deficient atmosphere is one that has 19.5% or less oxygen by volume for respirable air at sea-level conditions.

(3) They commonly occur in confined or unventilated cellars, wells, mines, ship holds, tanks, burning buildings, and enclosures containing inert atmospheres.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07263, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07265 What needs to be considered when combinations of contaminants occur in the workplace? Combinations of contaminants (gas, vapor and particulate) may occur simultaneously in the atmosphere. Contaminants may be entirely different substances (dusts and gases from blasting) or the particulate and vapor forms of the same substance. Synergistic effects (joint action of two or more agents that results in an effect that is greater than the sum of their individual effects) may occur. Such effects may require extraordinary protective measures.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07265, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07267 What are the two major types of respirators? Respirators are classified into the following categories:

(1) Air-purifying respirators. The following types of air-purifying respirators are available:

- Particulate-removing;
- Gas- and vapor-removing; and
- Combination particulate- and either gas- or vapor-removing.

(2) Atmosphere-supplying respirators. The following types of atmosphere-supplying respirators are available:

- Supplied-air or airline;
- Combination supplied-air and air-purifying;
- Combination supplied-air with auxiliary self-contained air supply; and
- Self-contained breathing apparatus (SCBA).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07267, filed 5/4/99, effective 9/1/99.]

Air-Purifying Respirators (APRS)

WAC 296-62-07269 What are air-purifying respirators (APRs)? (1) Air-purifying respirators remove particles, vapors, gases, or a combination of these contaminants by passing contaminated air through a filter, cartridge, or canister. The breathing action of the wearer operates the nonpowered type of respirator. The powered type contains a blower (usually carried by the wearer), that pulls contaminated air through air-purifying media and then blows the purified air to the respirator user. The nonpowered type is equipped with a tight-fitting facepiece or without one (for example, mouthpiece/nose clamp types). The powered type is equipped with a tight-fitting facepiece, helmet, hood, or suit.

(2) Air-purifying respirators are classified into the following categories:

- Particulate-removing respirators;
- Vapor- and gas-removing respirators; and

- Combinations of the above.

(3) Air-purifying respirators (APRs) are available as nonpowered, tight-fitting respirators, powered-air-purifying respirators (PAPRs) and mouthpiece respirators.

(4) A variety of tight-fitting APR styles are available ranging from half facepiece to full facepiece masks, including PAPRs. PAPRs are also available in loose-fitting styles, featuring a hood or helmet instead of a tight-fitting facepiece. Gas masks are only available in the full-facepiece style and some are classified as PAPRs.

(5) Mouthpiece respirators do not provide for a mask-to-face seal and are designed to be worn with a mouth bit and nose clamp.

(6) The most commonly used type of APR is a nonpowered, tight-fitting half-mask. The facepieces available for this type of respirator may be composed of silicone or other elastomeric materials if a cartridge type respirator is needed. Noncartridge types are called filtering facepiece respirators and are primarily composed of fibrous materials.

(7) Disposable options are available for either elastomeric or filtering facepiece type half-masks. Some disposables may last for only a brief period of use while others are designed for prolonged use (designed to have nonreplaceable parts), sometimes referred to as low maintenance respirators. Disposables are generally less expensive than nondisposable type half-masks.

(8) In addition, special cartridge-type half facepiece models may also be available with features designed for specific work operations. For example, low profile type half-masks are available to be worn under welding hoods.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07269, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07271 What are the general limitations for air-purifying respirators (APRs)? (1) Air-purifying respirators do not protect against oxygen-deficient atmospheres nor against skin irritation by, or absorption through the skin of, airborne contaminants.

(2) The maximum contaminant concentration against which an air-purifying respirator will protect is determined by the design and capacity of the cartridge, canister, or filter and the facepiece-to-face seal on the user. For gases and vapors, the maximum concentration for which the air-purifying element is designed is specified by the manufacturer or is listed on labels of cartridges and canisters.

(3) Nonpowered air-purifying respirators may not provide the assigned level of protection specified unless the facepiece is carefully fitted to the wearer's face to prevent leakage. The time period over which protection is provided is dependent on:

- Canister, cartridge, or filter capacity;
- Concentration of contaminant(s);
- Humidity levels in the ambient atmosphere; and
- The wearer's respiratory rate.

(4) The proper type of canister, cartridge, or filter must be selected for the particular atmosphere and conditions. Nonpowered air-purifying respirators may cause discomfort due to a noticeable resistance to inhalation. This problem is minimized with use of powered respirators. Respirator facepieces present special problems to individuals required to

wear prescription lenses (spectacle kits are available from some manufacturers). These devices do have the advantage of being small, light, and simple in operation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07271, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07273 What are particulate-removing respirators? Particulate-removing respirators are equipped with filter(s) to remove a single type of particulate matter (for example, dust) or a combination of two or more types of particulate matter (for example, dust and fume) from air. The filter may be a replaceable part or a permanent part of the respirator. It may also be a single-use or reusable type of filter.

(1) General limitations. Particulate-removing respirators provide protection against nonvolatile particles only. They do not protect against gases and vapors. They are not for use in atmospheres immediately dangerous to life or health (see WAC 296-62-07132).

(2) Full facepiece particulate respirators provide protection against eye irritation in addition to respiratory protection.

(3) Mouthpiece respirators must be used only for escape. Mouth breathing prevents detection of contaminant by odor. The nose clamp must be securely in place to prevent nasal breathing. A small, lightweight device that can be donned quickly.

(4) In environments with oil aerosols, you must not use "N" type particulate respirators.

(5) Combination particulate- and vapor- and gas-removing respirators are subject to the advantages and disadvantages of the component sections of the combination respirator as described above.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07273, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07275 What are vapor- and gas-removing respirators? Vapor- and gas-removing respirators are equipped with cartridge(s) or canister(s) to remove a single vapor or gas (for example, chlorine gas); a single class of vapors or gases (for example, organic vapors); or a combination of two or more classes or gases (for example, organic vapors, and acidic gases) from air.

(1) General limitations. Vapor and gas removing respirators do not provide protection against particulate contaminants. A rise in canister or cartridge temperature indicates that a gas or vapor is being removed from the inspired air. An uncomfortably high temperature indicates a high concentration of gas or vapor and requires immediate return to fresh air. Use must be avoided unless an ESLI or a change out schedule is available. They are not for use in atmospheres immediately dangerous to life or health.

(2) Full facepiece vapor- and gas-removing respirators provide protection against eye irritation in addition to respiratory protection.

(3) Mouthpiece respirators must be used only for escape. Mouth breathing prevents detection of contaminant by odor. The nose clamp must be securely in place to prevent nasal breathing. These are small lightweight devices that can be put on quickly.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07275, filed 5/4/99, effective 9/1/99.]

[Title 296 WAC—p. 1446]

WAC 296-62-07277 What are combination particulate- and vapor- and gas-removing respirators? Combination particulate- and vapor- and gas-removing respirators are equipped with cartridge(s) or canister(s) to remove particulate matter, vapors and gases from air. The filter may be a permanent part or a replaceable part of a cartridge or canister.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07277, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07279 What types of filters, canisters and cartridges are available for air-purifying respirators (APRs)? (1) Filters. Filters currently available for use against particulate contaminants are appropriate for solid particulates such as dusts or fumes, as well as being appropriate for nonvolatile, liquid particles such as sprays, mists and fogs.

(a) Cartridges or canister filters are available in addition to separate filter pads that can be added to some manufacturers' cartridges. They also may be formed into a filtering facepiece mask or as a wafer-like attachment. Regardless of how they are constructed, particulate filters are classified by physical limitations as "N," "R," and "P." Within each class, manufacturers may supply three different types of filters that reflect the efficiency rating (see below).

Class	Efficiency Rating		
N	95	99	100
R	95	99	100
P	95	99	100

(i) Filters that are classified as N-100, R-100, and P-100 are also referred to as HEPA filters. New particulate filters are more effective than older types of filters referred to as:

- Dust;
- Dust/mist; or
- Dust/fume/mist filters.

These older types of filters have highly variable efficiencies. They are no longer being manufactured and sold.

(ii) Any filter designated with "N" is appropriate for use in environments that do not contain oil. If you have oil aerosols, "R" or "P" designated filters are appropriate for use.

(b) Combination filters. Some vapor and gas cartridges and canisters have an added filter component for particulates. These are available as combination cartridges and will have a separate certification number listed on the respirator, packaging or in the operations manual for each type of contaminant.

(2) Canisters. Gas mask canisters are available for specific contaminants including ammonia, carbon monoxide, chlorine, phosphine and sulfur dioxide. Canisters are also available for general categories of chemical contaminants including acid gases, organic vapors, and pesticides. Canisters attachment options available are chin-, belt- or chest-mounted and a variety of canister sizes are available.

(3) Cartridges (nongas mask canisters). Cartridges are available for protection against specific contaminants and combinations of specific contaminants, including ammonia, chlorine, chlorine dioxide, formaldehyde, hydrogen chloride, hydrogen fluoride, hydrogen sulfide, mercury, methylamine, sulfur dioxide and vinyl chloride. Cartridges are also available for protection against general categories of chemical

contaminants, including organic vapors, paints/lacquers/enamels and pesticides. Cartridge attachment options available include face-, chin-, belt- or helmet-mounted.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07279, filed 5/4/99, effective 9/1/99.]

Atmosphere-Supplying Respirators

WAC 296-62-07281 How do atmosphere-supplying respirators work? (1) Atmosphere-supplying respirators supply a respirable atmosphere to the wearer.

(2) The two types of atmosphere-supplying respirators are:

- Self-contained breathing apparatus (SCBA); and
- Supplied-air respirators.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07281, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07283 What are the capabilities and limitations of atmosphere-supplying respirators? See WAC 296-62-07180 for the requirements on breathing gases used with atmosphere-supplying respirators.

(1) Capabilities. Atmosphere-supplying respirators provide protection against oxygen deficient and toxic atmospheres. The breathing atmosphere is independent of contaminated atmospheric conditions.

(2) General limitations. Except for some supplied-air suits, no protection is provided against skin irritation by materials such as ammonia and hydrogen chloride, or against absorption of materials such as hydrogen cyanide or organophosphate pesticides through the skin. Facepieces present special problems to individuals required to wear prescription lenses. Use of atmosphere-supplying respirators in atmospheres immediately dangerous to life or health is limited to specific devices under specified conditions (see WAC 296-62-07132).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07283, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07285 What is a supplied-air respirator? A supplied-air (or air-line) respirator provides respirable air through a small-diameter hose from a compressor or compressed-air cylinder(s). The hose is attached to the wearer by a belt or other suitable means and can be detached rapidly in an emergency. A flow-control valve or orifice is provided to govern the rate of air flow to the wearer. Exhaled air passes to the ambient atmosphere through a valve(s) or opening(s) in the enclosure (facepiece, helmet, hood, or suit). Up to 300 feet (91 meters) of hose length is permissible. Hose supplied by the manufacturer and recommended operating pressures and hose lengths must be used.

Supplied-air respirators are classified in the following ways:

(1) Continuous-flow respirators, which are equipped with a facepiece, hood, helmet, or suit. At least 115 liters (four cubic feet) of air per minute to tight-fitting facepieces and 170 liters (six cubic feet) of air per minute to loose fitting helmets, hoods and suits are required. Air is supplied to a suit through a system of internal tubes to the head, trunk and

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extremities through valves located in appropriate parts of the suit.

(2) Demand type (negative pressure) respirators, which are only equipped with a facepiece. The demand valve permits flow of air only during inhalation.

(3) Pressure-demand type (positive pressure) respirators, which are only equipped with a facepiece. A positive pressure is maintained in the facepiece.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07285, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07287 What are the general capabilities and limitations of supplied-air respirators? (1) Capabilities. The respirable air supply is not limited to the quantity the individual can carry, and the devices are lightweight and simple. The demand type produces a negative pressure in the facepiece on inhalation, whereas continuous-flow and pressure-demand types maintain a positive-pressure in the respirator-inlet covering and are less apt to permit inward leakage of contaminants. Supplied-air suits may protect against atmospheres that irritate the skin or that may be absorbed through the unbroken skin.

(2) Limitations. Employees are restricted in movement by the hose and must return to a respirable atmosphere by retracing their route of entry. The hose may be severed or pinched off. Supplied-air respirators provide no protection if the air supply fails. Some contaminants, such as tritium, may penetrate the material of an supplied-air suit and limit its effectiveness. Other contaminants, such as fluorine, may react chemically with the material of a supplied-air suit and damage it.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07287, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07289 What are combination supplied-air and air-purifying respirators? Combination supplied-air and air-purifying respirators provide the wearer with the option of using either of two different modes of operation:

(1) A supplied-air respirator with an auxiliary air-purifying attachment which provides protection in the event the air supply fails; or

(2) The advantages and disadvantages previously described for supplied-air and air-purifying respirators apply when these respirators are used in combination. The mode with the greater limitations (air-purifying mode) will generally determine the overall capabilities and limitations of the respirator, since the wearer may for some reason fail to change the mode of operation even though conditions require such a change.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07289, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07291 What are combination supplied-air respirators with auxiliary self-contained air supply? Some combination supplied-air respirators have an auxiliary self-contained air supply. To escape from a hazardous atmosphere in the event the primary air supply fails to operate, the wearer switches to the auxiliary self-contained air supply. Devices approved for both entry into and escape from dan-

gerous atmospheres have a low-pressure warning alarm and contain at least a 5-minute self-contained air supply. The auxiliary self-contained air supply on this type of device allows the wearer to escape from a dangerous atmosphere. This device with auxiliary self-contained air supply is approved for escape and may be used for entry when it contains at least a 15-minute auxiliary self-contained air supply and not more than 20 percent of the rated self-contained air supply is used during entry (see WAC 296-62-07132).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07291, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07293 What is a self-contained breathing apparatus respirator (SCBA)? SCBAs are respirators designed so that the supply of air, oxygen, or oxygen-generated material is carried by the wearer. They are normally equipped with a full facepiece, but may be equipped with a half-mask facepiece, helmet, hood or mouthpiece and nose clamp.

SCBAs are classified in the following ways:

(1) Closed-circuit SCBA (oxygen only, negative pressure or positive pressure). There are two types of closed-circuit SCBAs. They are:

(a) Compressed liquid oxygen respirators, which are equipped with a facepiece or mouthpiece and nose clamp. High-pressure oxygen from a gas cylinder passes through a high-pressure reducing valve and, in some designs, through a low-pressure admission valve to a breathing bag or container. Liquid oxygen is converted to low-pressure gaseous oxygen and delivered to the breathing bag. The wearer inhales from the bag through a corrugated tube connected to a mouthpiece or facepiece and a one-way check valve. Exhaled air passes through another check valve and tube into a container of carbon-dioxide removing chemical and reenters the breathing bag. Make-up oxygen enters the bag continuously or as the bag deflates sufficiently to actuate an admission valve. A pressure-relief system is provided, and a manual bypass and saliva trap may be provided depending upon the design.

(b) Oxygen-generating respirators, which are equipped with a facepiece or mouthpiece and nose clamp. Water vapor in the exhaled breath reacts with the chemical in the canister to release oxygen to the breathing bag. The wearer inhales from the bag through a corrugated tube and one-way check valve at the facepiece. Exhaled air passes through a second check valve/breathing tube assembly into the canister. The oxygen-release rate is governed by the volume of exhaled air. Carbon dioxide in the exhaled breath is removed by the canister fill.

(2) Open-circuit (SCBA) (compressed air, compressed oxygen, liquid air, liquid oxygen). A bypass system is provided in case of regulator failure except on escape-type units. There are two types of open-circuit SCBAs. They are:

(a) Demand-type respirators, which are equipped with a facepiece or mouthpiece and nose clamp. The demand valve permits oxygen or air flow only during inhalation. Exhaled breath passes to ambient atmosphere through a valve(s) in the facepiece.

(b) Pressure-demand type respirators, which are equipped with a facepiece only. Positive pressure is maintained in the facepiece. The apparatus may have provision

for the wearer to select the demand or pressure-demand mode of operation, in which case only the demand mode must be used when putting on or removing the apparatus.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07293, filed 5/4/99, effective 9/1/99.]

WAC 296-62-07295 What are the limitations for self-contained breathing apparatus respirators (SCBA)? (1) The period over which the SCBAs will provide protection is limited by the amount of air or oxygen in the apparatus, the ambient atmospheric pressure (service life of open-circuit devices is cut in half by a doubling of the atmospheric pressure), and the type of work being performed. Some SCBA devices have a short service life (less than 15 minutes) and are suitable only for escape (self-rescue) from an irreparable atmosphere. Chief limitations of SCBA devices are their weight, bulk, limited service life, and the training requirements for their maintenance and safe use.

(2) What are the limitations for closed-circuit SCBAs?

The closed-circuit operation conserves oxygen and permits longer service life at reduced weight. The negative-pressure type produces a negative pressure in the respiratory-inlet covering during inhalation, and this may permit inward leakage of contaminants; the positive-pressure type always maintains a positive pressure in the respiratory-inlet covering and is less apt to permit inward leakage of contaminants.

(3) What are the limitations for open circuit SCBAs?

The demand type produces a negative pressure in the respiratory-inlet covering during inhalation, whereas the pressure-demand type maintains a positive pressure in the respiratory-inlet covering during inhalation and is less apt to permit inward leakage of contaminants.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07295, filed 5/4/99, effective 9/1/99.]

PART F—CARCINOGENS

WAC 296-62-073 Carcinogens—Scope and application. (1) All sections of this chapter which include WAC 296-62-073 in the section number apply to the manufacturing, processing, repackaging, releasing, handling or storing of carcinogens.

(2) This section shall not apply to solid or liquid mixtures containing less than 0.1 percent by weight or volume of the carcinogens listed in WAC 296-62-07302.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-073, filed 11/30/87. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-073, filed 11/13/80; Order 76-6, § 296-62-073, filed 3/1/76; Order 74-35, § 296-62-073, filed 9/20/74.]

WAC 296-62-07302 List of carcinogens. (1) The following substances are deemed to be carcinogens for the purposes of WAC 296-62-073 through 296-62-07316.

(2) Any reference to carcinogens in WAC 296-62-07304 through 296-62-07316 shall mean only those carcinogens listed in WAC 296-62-07302.

(a) 4-Nitrobiphenyl - Chemical Abstracts Registry Number 92-93-3.

(b) Alpha-Naphthylamine - Chemical Abstracts Registry Number 134-32-7.

(c) 4,4' Methylene bis (2 - chloroaniline) - Chemical Abstracts Service Registry Number 101-14-4.

(d) Methyl chloromethyl ether - Chemical Abstracts Service Registry Number 107-30-2.

(e) 3,3'-Dichlorobenzidine (and its salts) - Chemical Abstracts Service Registry Number 91-94-1.

(f) Bis-Chloromethyl ether - Chemical Abstracts Service Registry Number 542-88-1.

(g) Beta-Naphthylamine - Chemical Abstracts Service Registry Number 91-59-8.

(h) Benzidine - Chemical Abstracts Service Registry Number 92-87-5.

(i) 4-Aminodiphenyl - Chemical Abstracts Service Registry Number 92-67-1.

(j) Ethyleneimine - Chemical Abstracts Service Registry Number 151-56-4.

(k) Beta-Propiolactone - Chemical Abstracts Service Registry Number 57-57-8.

(l) 2-Acetylaminofluorene - Chemical Abstracts Service Registry Number 53-96-3.

(m) 4-Dimethylaminoazobenzene - Chemical Abstracts Service Registry Number 60-11-7.

(n) N-Nitrosodimethylamine - Chemical Abstracts Service Registry Number 62-75-9.

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07302, filed 7/20/94, effective 9/20/94. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-10-004 (Order 85-09), § 296-62-07302, filed 4/19/85; 82-13-045 (Order 82-22), § 296-62-07302, filed 6/11/82; 81-07-048 (Order 81-4), § 296-62-07302, filed 3/17/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07302, filed 11/13/80.]

WAC 296-62-07304 Definitions. The definitions set forth in this section apply throughout WAC 296-62-073 through 296-62-07316.

(1) Absolute filter - is one capable of retaining 99.97 percent of a mono disperse aerosol of 0.3 micron size particles.

(2) Authorized employee - an employee whose duties require him to be in the regulated area and who has been specifically assigned to those duties by the employer.

(3) Clean change room - a room where employees put on clean clothing and/or protective equipment in an environment free of carcinogens listed in WAC 296-62-07302. The clean change room shall be contiguous to and have an entry from a shower room, when the shower room facilities are otherwise required in this section.

(4) Closed system - an operation involving carcinogens listed in WAC 296-62-07302 where containment prevents the release of carcinogens into regulated areas, or the external environment.

(5) Decontamination - the inactivation of a carcinogen listed in WAC 296-62-07302 or its safe disposal.

(6) Disposal - the safe removal of a carcinogen listed in WAC 296-62-07302 from the work environment.

(7) Emergency - an unforeseen circumstance or set of circumstances resulting in the release of a carcinogen which may result in exposure to or contact with any carcinogen listed in WAC 296-62-07302.

(8) External environment - any environment external to regulated and nonregulated areas.

(9) Isolated system - a fully enclosed structure other than the vessel of containment of a listed carcinogen which is impervious to the passage of listed carcinogens and which would prevent the entry of carcinogens into regulated areas, nonregulated areas, or the external environment, should leakage or spillage from the vessel of containment occur.

(10) Laboratory-type hood - a device enclosed on three sides and the top and bottom, designed and maintained so as to draw air inward at an average linear face velocity of 150 feet per minute with a minimum of 125 feet per minute, designed, constructed and maintained such that an operation involving a listed carcinogen within the hood does not require the insertion of any portion of any employees' body other than his hands and arms.

(11) Nonregulated area - any area under the control of the employer where entry and exit is neither restricted nor controlled.

(12) Open-vessel system - an operation involving listed carcinogens in an open vessel, which is not in an isolated system, a laboratory-type hood, nor in any other system affording equivalent protection against the entry of carcinogens into regulated areas, nonregulated areas, or the external environment.

(13) Protective clothing - clothing designed to protect an employee against contact with or exposure to listed carcinogens.

(14) Regulated area - an area where entry and exit is restricted and controlled.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07304, filed 11/30/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 81-07-048 (Order 81-4), § 296-62-07304, filed 3/17/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07304, filed 11/13/80.]

WAC 296-62-07306 Requirements for areas containing carcinogens listed in WAC 296-62-07302. (1) A regulated area shall be established by an employer where listed carcinogens are manufactured, processed, used, repackaged, released, handled or stored.

(2) All such areas shall be controlled in accordance with the requirements for the following category or categories describing the operation involved:

(a) Isolated systems. Employees working with carcinogens within an isolated system such as a "glove box" shall wash their hands and arms upon completion of the assigned task and before engaging in other activities not associated with the isolated system.

(b) Closed system operation. Within regulated areas where carcinogens are stored in sealed containers, or contained in a closed system including piping systems with any sample ports or openings closed while carcinogens are contained within:

(i) Access shall be restricted to authorized employees only;

(ii) Employees shall be required to wash hands, forearms, face and neck upon each exit from the regulated areas, close to the point of exit and before engaging in other activities.

(c) Open vessel system operations. Open vessel system operations as defined in WAC 296-62-07304(12) are prohibited.

(d) Transfer from a closed system. Charging or discharging point operations, or otherwise opening a closed system. In operations involving "laboratory-type hoods," or in locations where a carcinogen is contained in an otherwise "closed system," but is transferred, charged, or discharged into other normally closed containers, the provisions of this section shall apply.

(i) Access shall be restricted to authorized employees only;

(ii) Each operation shall be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation. Exhaust air shall not be discharged to regulated areas, nonregulated areas or the external environment unless decontaminated. Clean makeup air shall be introduced in sufficient volume to maintain the correct operation of the local exhaust system.

(iii) Employees shall be provided with, and required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area.

(iv) Employees engaged in handling operations involving the following carcinogens must be provided with and required to wear and use a full-face, supplied-air respirator, of the continuous flow or pressure-demand type as required in chapter 296-62 WAC, Part E:

- Methyl Chloromethyl Ether;
- bis-Chloromethyl Ether;
- Ethylenimine;
- beta-Propiolactone;
- 4-Amino Diphenyl.

(v) Employees engaged in handling operations involving:

- 4-nitrobiphenyl;
- alpha-naphthylamine;
- 4-4'methylene bis(2-chloroaniline);
- 3-3'dichlorobenzidine (and its salts);
- beta-naphthylamine;
- benzidine;
- 2-acetylamino fluorene;
- 4-dimethylaminobenzene;
- n-nitrosodimethylamine

must be provided with, and required to wear and use, a half-face, filter-type respirator certified for solid or liquid particulates with minimum efficiency rating of 95% as required in chapter 296-62 WAC, Part E. A respirator affording higher levels of protection than this respirator may be substituted.

(vi) Prior to each exit from a regulated area, employees shall be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers shall be identified, as required under WAC 296-62-07310 (2), (3) and (4).

(vii) Employees shall be required to wash hands, forearms, face and neck on each exit from the regulated area, close to the point of exit, and before engaging in other activities.

(viii) Employees shall be required to shower after the last exit of the day.

(ix) Drinking fountains are prohibited in the regulated area.

(e) Maintenance and decontamination activities. In clean up of leaks or spills, maintenance or repair operations on contaminated systems or equipment, or any operations involving work in an area where direct contact with carcinogens could result, each authorized employee entering the area shall:

(i) Be provided with and required to wear, clean, impervious garments, including gloves, boots and continuous-air supplied hood in accordance with chapter 296-24 WAC, the general safety and health standards, and respiratory protective equipment required by this chapter 296-62 WAC;

(ii) Be decontaminated before removing the protective garments and hood;

(iii) Be required to shower upon removing the protective garments and hood.

(f) Laboratory activities. The requirements of this subdivision shall apply to research and quality control activities involving the use of carcinogens listed in WAC 296-62-07302.

(i) Mechanical pipetting aids shall be used for all pipetting procedures.

(ii) Experiments, procedures and equipment which could produce aerosols shall be confined to laboratory-type hoods or glove boxes.

(iii) Surfaces on which carcinogens are handled shall be protected from contamination.

(iv) Contaminated wastes and animal carcasses shall be collected in impervious containers which are closed and decontaminated prior to removal from the work area. Such wastes and carcasses shall be incinerated in such a manner that no carcinogenic products are released.

(v) All other forms of listed carcinogens shall be inactivated prior to disposal.

(vi) Laboratory vacuum systems shall be protected with high efficiency scrubbers or with disposable absolute filters.

(vii) Employees engaged in animal support activities shall be:

(A) Provided with, and required to wear, a complete protective clothing change, clean each day, including coveralls or pants and shirt, foot covers, head covers, gloves, and appropriate respiratory protective equipment or devices; and

(B) Prior to each exit from a regulated area, employees shall be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers shall be identified as required under WAC 296-62-07310 (2), (3) and (4).

(C) Required to wash hands, forearms, face and neck upon each exit from the regulated area close to the point of exit, and before engaging in other activities; and

(D) Required to shower after the last exit of the day.

(viii) Employees, other than those engaged only in animal support activities, each day shall be:

(A) Provided with and required to wear a clean change of appropriate laboratory clothing, such as a solid front gown, surgical scrub suit, or fully buttoned laboratory coat.

(B) Prior to each exit from a regulated area, employees shall be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers shall be identified as required under WAC 296-62-07310 (2), (3) and (4).

(C) Required to wash hands, forearms, face and neck upon each exit from the regulated area close to the point of exit, and before engaging in other activities.

(ix) Air pressure in laboratory areas and animal rooms where carcinogens are handled and bioassay studies are performed shall be negative in relation to the pressure in surrounding areas. Exhaust air shall not be discharged to regulated areas, nonregulated areas or the external environment unless decontaminated.

(x) There shall be no connection between regulated areas and any other areas through the ventilation system.

(xi) A current inventory of the carcinogens shall be maintained.

(xii) Ventilated apparatus such as laboratory-type hoods, shall be tested at least semi-annually or immediately after ventilation modification or maintenance operations, by personnel fully qualified to certify correct containment and operation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07306, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 96-09-030, § 296-62-07306, filed 4/10/96, effective 6/1/96. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-07306, filed 7/25/86; 85-10-004 (Order 85-09), § 296-62-07306, filed 4/19/85. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-015 (Order 81-20), § 296-62-07306, filed 7/27/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07306, filed 11/13/80.]

WAC 296-62-07308 General regulated area requirements. (1) Respirator program. The employer must implement a respiratory protection program as required in chapter 296-62 WAC, Part E (except WAC 296-62-07130 (1) and (5) and 296-62-07131).

(2) Emergencies. In an emergency, immediate measures including, but not limited to, the requirements of (a), (b), (c), (d) and (e) of this subsection shall be implemented.

(a) The potentially affected area shall be evacuated as soon as the emergency has been determined.

(b) Hazardous conditions created by the emergency shall be eliminated and the potentially affected area shall be decontaminated prior to the resumption of normal operations.

(c) Special medical surveillance by a physician shall be instituted within twenty-four hours for employees present in the potentially affected area at the time of the emergency. A report of the medical surveillance and any treatment shall be included in the incident report, in accordance with WAC 296-62-07312(2).

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(d) Where an employee has a known contact with a listed carcinogen, such employee shall be required to shower as soon as possible, unless contraindicated by physical injuries.

(e) An incident report on the emergency shall be reported as provided in WAC 296-62-07312(2).

(3) Hygiene facilities and practices.

(a) Storage or consumption of food, storage or use of containers of beverages, storage or application of cosmetics, smoking, storage of smoking materials, tobacco products or other products for chewing, or the chewing of such products, are prohibited in regulated areas.

(b) Where employees are required by this section to wash, washing facilities shall be provided in accordance with WAC 296-24-12009, of the general safety and health standards.

(c) Where employees are required by this section to shower, shower facilities shall be provided.

(i) One shower shall be provided for each ten employees of each sex, or numerical fraction thereof, who are required to shower during the same shift.

(ii) Body soap or other appropriate cleansing agents convenient to the showers shall be provided as specified in WAC 296-24-12009, of the general safety and health standards.

(iii) Showers shall be provided with hot and cold water feeding a common discharge line.

(iv) Employees who use showers shall be provided with individual clean towels.

(d) Where employees wear protective clothing and equipment, clean change rooms shall be provided and shall be equipped with storage facilities for street clothes and separate storage facilities for the protective clothing for the number of such employees required to change clothes.

(e) Where toilets are in regulated areas, such toilets shall be in a separate room.

(4) Contamination control.

(a) Regulated areas, except for outdoor systems, shall be maintained under pressure negative with respect to nonregulated areas. Local exhaust ventilation may be used to satisfy this requirement. Clean makeup air in equal volume shall replace air removed.

(b) Any equipment, material, or other item taken into or removed from a regulated area shall be done so in a manner that does not cause contamination in nonregulated areas or the external environment.

(c) Decontamination procedures shall be established and implemented to remove carcinogens from the surfaces of materials, equipment and the decontamination facility.

(d) Dry sweeping and dry mopping are prohibited.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07308, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-07308, filed 11/30/83. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07308, filed 11/13/80.]

WAC 296-62-07310 Signs, information and training.

(1) Signs.

(a) Entrances to regulated areas shall be posted with signs bearing the legend:

[Title 296 WAC—p. 1451]

CANCER-SUSPECT AGENT

AUTHORIZED PERSONNEL ONLY

(b) Entrances to regulated areas containing operations covered in WAC 296-62-07306 (2)(e) shall be posted with signs bearing the legend:

CANCER-SUSPECT AGENT EXPOSED IN THIS AREA

IMPERVIOUS SUIT INCLUDING GLOVES,
BOOTS, AND AIR-SUPPLIED HOOD
REQUIRED AT ALL TIMES

AUTHORIZED PERSONNEL ONLY

(c) Appropriate signs and instructions shall be posted at the entrance to, and exit from, regulated areas, informing employees of the procedures that must be followed in entering and leaving a regulated area.

(2) Container contents, identification.

(a) Containers of carcinogens named in WAC 296-62-07302 and containers required in WAC 296-62-07306 (2)(d)(v) and 296-62-07306 (2)(f)(vii)(B) and 296-62-07306 (2)(f)(viii)(B) which are accessible only to, and handled only by authorized employees, or by other employees training in accordance with WAC 296-62-07310(5), may have contents identification limited to a generic or proprietary name, or other proprietary identification of the carcinogen and percent.

(b) Containers of carcinogens and containers required under WAC 296-62-07306 (2)(d)(v) and 296-62-07306 (2)(f)(vii)(B) and 296-62-07306 (2)(f)(viii)(B) which are accessible to, or handled by employees other than authorized employees or employees trained in accordance with WAC 296-62-07310(5) shall have contents identification which includes the full chemical name and Chemical Abstracts Service Registry number as listed in WAC 296-62-07302.

(c) Containers shall have the warning words "CANCER-SUSPECT AGENT" displayed immediately under or adjacent to the contents identification.

(d) Containers which have carcinogenic contents with corrosive or irritating properties shall have label statements warning of such hazards, noting, if appropriate, particularly sensitive or affected portions of the body.

(3) Lettering. Lettering on signs and instructions required by WAC 296-62-07310(1) shall be a minimum letter height of two inches. Labels on containers required under this section shall not be less than one-half the size of the largest lettering on the package, and not less than eight point type in any instance: Provided, that no such required lettering need be more than one inch in height.

(4) Prohibited statements. No statements shall appear on or near any required sign, label, or instruction which contradicts or detracts from the effect of any required warning, information or instruction.

(5) Training and indoctrination.

(a) Each employee prior to being authorized to enter a regulated area, shall receive a training and indoctrination program including, but not necessarily limited to:

(i) The nature of the carcinogenic hazards of listed carcinogens, including local and systemic toxicity;

(ii) The specific nature of the operation involving carcinogens which could result in exposure;

(iii) The purpose for and application of the medical surveillance program, including, as appropriate, methods of self-examination;

(iv) The purpose for and application of decontamination practices and purposes;

(v) The purpose for and significance of emergency practices and procedures;

(vi) The employee's specific role in emergency procedures;

(vii) Specific information to aid the employee in recognition and evaluation of conditions and situations which may result in the release of listed carcinogens;

(viii) The purpose for and application of specific first-aid procedures and practices;

(ix) A review of this section at the employee's first training and indoctrination program and annually thereafter.

(b) Specific emergency procedures shall be prescribed, and posted, and employees, shall be familiarized with their terms, and rehearsed in their application.

(c) All materials relating to the program shall be provided upon request to the director.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07310, filed 11/30/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 81-07-048 (Order 81-4), § 296-62-07310, filed 3/17/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07310, filed 11/13/80.]

WAC 296-62-07312 Reports. (1) Operations. Not later than October 30, 1974, the information required in WAC 296-62-07312 (1)(a), (b), (c) and (d) of this section shall be reported in writing to the industrial hygiene section, division of industrial safety and health. Any changes in such information shall be similarly reported in writing within 15 calendar days of such change.

(a) A brief description and in plant location of the area(s) regulated and the address of each regulated area;

(b) The name(s) and other identifying information as to the presence of listed carcinogens in each regulated area;

(c) The number of employees in each regulated area, during normal operations including maintenance activities; and

(d) The manner in which a carcinogen is present in each regulated area; e.g., whether it is manufactured, processed, used, repackaged, released, stored, or otherwise handled.

(2) Incidents. Incidents which result in the release of a listed carcinogen into any area where employees may be potentially exposed shall be reported in accordance with this subsection.

(a) A report of the occurrence of the incident and the facts obtainable at that time including a report on any medical treatment of affected employees shall be made within 24 hours to the industrial hygiene section, division of industrial safety and health.

(b) A written report shall be filed with the industrial hygiene section, division of industrial safety and health, within 15 calendar days thereafter and shall include:

(i) A specification of the amount of material released, the amount of time involved, and an explanation of the procedure used in determining this figure;

(ii) A description of the area involved, and the extent of known and possible employee exposure and area contamination;

(iii) A report of any medical treatment of affected employees, and any medical surveillance program implemented; and

(iv) An analysis of the circumstances of the incident, and measures taken or to be taken, with specific completion dates, to avoid further similar releases.

CARCINOGEN STANDARD REPORT

Company: Prepared By:
 Plant Address: Title:
 Date:

Compound and Other Identifying Information	Description of Inplant Location of Regulated Area*	Number of Employees in Each Regulated Area* Normally Maintenance	Manner** In Which Compound is Present in Each Regulated Area*
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* See WAC 296-62-07308 for definition of "regulated area."
 ** Indicated whether manufactured, processed, used, repackaged, released, stored, or if otherwise handled (describe).

[Statutory Authority: RCW 49.17.040 and 49.17.050, 81-07-048 (Order 81-4), § 296-62-07312, filed 3/17/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07312, filed 11/13/80.]

WAC 296-62-07314 Medical surveillance. (1) At no cost to the employee, a program of medical surveillance shall be established and implemented for employees considered for assignment to enter regulated areas, and for authorized employees.

(2) Examinations.

(a) Before an employee is assigned to enter a regulated area, a preassignment physical examination by a physician shall be provided and shall include a personal history of the employee and/or his/her family and occupation background, including genetic and environmental factors.

(i) Taking of employees medical history and background history shall be considered routine part of standard medical practice.

(ii) This provision does not require "genetic testing" of any employee.

(iii) This provision does not require the exclusion of otherwise qualified employees from jobs on the basis of genetic factors.

(b) Authorized employees shall be provided periodic physical examination, not less often than annually, following the preassignment examination.

(c) In all physical examinations, the examining physician shall be requested to consider whether there exist conditions of increased risk, including reduced immunological competence, those undergoing treatment with steroids or cytotoxic agents, pregnancy and cigarette smoking.

(2001 Ed.)

(3) Records.

(a) Employers of employees examined pursuant to this subdivision shall cause to be maintained complete and accurate records of all such medical examinations. Records shall be maintained for the duration of the employee's employment. Upon termination of the employee's employment, including retirement or death, or in the event that the employer ceases business without a successor, records, or notarized true copies thereof, shall be forwarded by registered mail to the director.

(b) Records required by this section shall be provided upon request to employees, designated representatives, and the director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217. These records shall also be provided upon request to the director.

(c) Any employer who requests a physical examination of one of his employees or prospective employees as required by this section shall obtain from the physician a statement of the employee's suitability for employment in the specific exposure.

[Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), § 296-62-07314, filed 1/10/91, effective 2/12/91; 90-03-029 (Order 89-20), § 296-62-07314, filed 1/11/90, effective 2/26/90. Statutory Authority: RCW 49.17.040 and 49.17.050, 83-15-017 (Order 83-19), § 296-62-07314, filed 7/13/83, effective 9/12/83. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07314, filed 11/13/80.]

WAC 296-62-07316 Premixed solutions. (1) Where 4,4'-Methylene bis (2-chloroaniline) is present only in a single solution at a temperature not exceeding 220°F. the establishment of a regulated area is not required; however,

(a) Only authorized employees shall be permitted to handle such materials.

(b) Each day employees shall be provided with and required to wear a clean change of protective clothing (smocks, coveralls, or long-sleeved shirts and pants), gloves and other protective garments and equipment necessary to prevent contact with the solution in the process used.

(c) Employees shall be required to remove and leave protective clothing and equipment when leaving the work area at the end of the work day, or at any time solution is spilled on such clothing or equipment. Used clothing and equipment shall be placed in impervious containers for purposes of decontamination or disposal. The contents of such impervious containers shall be identified, as required under WAC 296-62-07310 (2), (3) and (4).

(d) Employees shall be required to wash hands and face after removing such clothing and equipment and before engaging in other activities.

(e) Employees assigned to work covered by this section shall be deemed to be working in regulated areas for the purposes of WAC 296-62-07308 (1), (2)(a) and (b), and (3)(c) and (d), WAC 296-62-07310, 296-62-07312 and 296-62-07314.

(f) Work areas where solution may be spilled shall be:

(i) Covered daily or after any spill with a clean covering; or

(ii) Clean thoroughly, daily and after any spill.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-07316, filed 11/13/80.]

PART G—CARCINOGENS (SPECIFIC)

WAC 296-62-07329 Vinyl chloride. (1) Scope and application.

(a) This section includes requirements for the control of employee exposure to vinyl chloride (chloroethene), Chemical Abstracts Service Registry No. 75014.

(b) This section applies to the manufacture, reaction, packaging, repackaging, storage, handling or use of vinyl chloride or polyvinyl chloride, but does not apply to the handling or use of fabricated products made of polyvinyl chloride.

(c) This section applies to the transportation of vinyl chloride or polyvinyl chloride except to the extent that the department of transportation may regulate the hazards covered by this section.

(2) Definitions.

(a) "Action level" means a concentration of vinyl chloride of 0.5 ppm averaged over an 8-hour work day.

(b) "Authorized person" means any person specifically authorized by the employer whose duties require him/her to enter a regulated area or any person entering such an area as a designated representative of employees for the purpose of exercising an opportunity to observe monitoring and measuring procedures.

(c) "Director" means the director of department of labor and industries or his/her designated representative.

(d) "Emergency" means any occurrence such as, but not limited to, equipment failure, or operation of a relief device which is likely to, or does, result in massive release of vinyl chloride.

(e) "Fabricated product" means a product made wholly or partly from polyvinyl chloride, and which does not require further processing at temperatures, and for times, sufficient to cause mass melting of the polyvinyl chloride resulting in the release of vinyl chloride.

(f) "Hazardous operation" means any operation, procedure, or activity where a release of either vinyl chloride liquid or gas might be expected as a consequence of the operation or because of an accident in the operation, which would result in an employee exposure in excess of the permissible exposure limit.

(g) "Polyvinyl chloride" means polyvinyl chloride homopolymer or copolymer before such is converted to a fabricated product.

(h) "Vinyl chloride" means vinyl chloride monomer.

(3) Permissible exposure limit.

(a) No employee may be exposed to vinyl chloride at concentrations greater than 1 ppm averaged over any 8-hour period, and

(b) No employee may be exposed to vinyl chloride at concentrations greater than 5 ppm averaged over any period not exceeding 15 minutes.

(c) No employee may be exposed to vinyl chloride by direct contact with liquid vinyl chloride.

(4) Monitoring.

(a) A program of initial monitoring and measurement shall be undertaken in each establishment to determine if there is any employee exposed, without regard to the use of respirators, in excess of the action level.

(b) Where a determination conducted under subdivision (a) of this subsection shows any employee exposures without regard to the use of respirators, in excess of the action level, a program for determining exposures for each such employee shall be established. Such a program:

(i) Shall be repeated at least monthly where any employee is exposed, without regard to the use of respirators, in excess of the permissible exposure limit.

(ii) Shall be repeated not less than quarterly where any employee is exposed, without regard to the use of respirators, in excess of the action level.

(iii) May be discontinued for any employee only when at least two consecutive monitoring determinations, made not less than 5 working days apart, show exposures for that employee at or below the action level.

(c) Whenever there has been a production, process or control change which may result in an increase in the release of vinyl chloride, or the employer has any other reason to suspect that any employee may be exposed in excess of the action level, a determination of employee exposure under subdivision (a) of this subsection shall be performed.

(d) The method of monitoring and measurement shall have an accuracy (with a confidence level of 95 percent) of not less than plus or minus 50 percent from 0.25 through 0.5 ppm, plus or minus 35 percent from over 0.5 ppm through 1.0 ppm, plus or minus 25 percent over 1.0 ppm, (methods meeting these accuracy requirements are available from the director).

(e) Employees or their designated representatives shall be afforded reasonable opportunity to observe the monitoring and measuring required by this subsection.

(5) Regulated area.

(a) A regulated area shall be established where:

(i) Vinyl chloride or polyvinyl chloride is manufactured, reacted, repackaged, stored, handled or used; and

(ii) Vinyl chloride concentrations are in excess of the permissible exposure limit.

(b) Access to regulated areas shall be limited to authorized persons.

(6) Methods of compliance. Employee exposures to vinyl chloride shall be controlled to at or below the permissible exposure limit provided in subsection (3) of this section by engineering, work practice, and personal protective controls as follows:

(a) Feasible engineering and work practice controls shall immediately be used to reduce exposures to at or below the permissible exposure limit.

(b) Wherever feasible engineering and work practice controls which can be instituted immediately are not sufficient to reduce exposures to at or below the permissible exposure limit, they shall nonetheless be used to reduce exposures to the lowest practicable level, and shall be supplemented by respiratory protection in accordance with subsection (7) of this section. A program shall be established and implemented to reduce exposures to at or below the permissible exposure

limit, or to the greatest extent feasible, solely by means of engineering and work practice controls, as soon as feasible.

(c) Written plans for such a program shall be developed and furnished upon request for examination and copying to the director. Such plans shall be updated at least every six months.

(7) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this section.

(b) Respirator program. The employer must establish, implement, and maintain a respiratory protection program as required in chapter 296-62 WAC, Part E (except WAC 296-62-07130(1), 296-62-07131 (4)(b)(i) and (ii), and 296-62-07150 through 296-62-17156).

(c) Respirator selection. Respirators must be selected from the following table.

Atmospheric concentration of Vinyl Chloride	Apparatus
(i) Not over 10 ppm	Any chemical cartridge respirator with a vinyl chloride cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm.
(ii) Not over 25 ppm	(A) A powered air-purifying respirator with hood, helmet, full or half facepiece, and a canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm, or (B) Gas mask, front or back-mounted canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm.
(iii) Not over 100 ppm	Supplied air respirator demand type, with full facepiece.
(iv) Not over 250 ppm	Type C, supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood.
(v) Not over 3,600 ppm	Combination Type C supplied air respirator, pressure demand type, with full or half facepiece and auxiliary self-contained air supply.
(vi) Unknown, or above 3,600 ppm	Open-circuit, self-contained breathing apparatus, pressure demand type, with full facepiece.

(d) Where air-purifying respirators are used:

(i) Air-purifying canisters or cartridges must be replaced prior to the expiration of their service life or the end of the shift in which they are first used, whichever occurs first, and

(ii) A continuous monitoring and alarm system must be provided when concentrations of vinyl chloride could reasonably exceed the allowable concentrations for the devices in use. Such system shall be used to alert employees when vinyl chloride concentrations exceed the allowable concentrations for the devices in use, and

(iii) Respirators specified for higher concentrations may be used for lower concentration.

(8) Hazardous operations.

(a) Employees engaged in hazardous operations, including entry of vessels to clean polyvinyl chloride residue from vessel walls, shall be provided and required to wear and use;

(i) Respiratory protection in accordance with subsections (3) and (7) of this section; and

(ii) Protective garments to prevent skin contact with liquid vinyl chloride or with polyvinyl chloride residue from vessel walls. The protective garments shall be selected for the operation and its possible exposure conditions.

(b) Protective garments shall be provided clean and dry for each use.

(c) Emergency situations. A written operational plan for emergency situations shall be developed for each facility storing, handling, or otherwise using vinyl chloride as a liquid or compressed gas. Appropriate portions of the plan shall be implemented in the event of an emergency. The plan shall specifically provide that:

(i) Employees engaged in hazardous operations or correcting situations of existing hazardous releases shall be equipped as required in subdivisions (a) and (b) of this subsection;

(ii) Other employees not so equipped shall evacuate the area and not return until conditions are controlled by the methods required in subsection (6) of this section and the emergency is abated.

(9) Training. Each employee engaged in vinyl chloride or polyvinyl chloride operations shall be provided training in a program relating to the hazards of vinyl chloride and precautions for its safe use.

(a) The program shall include:

(i) The nature of the health hazard from chronic exposure to vinyl chloride including specifically the carcinogenic hazard;

(ii) The specific nature of operations which could result in exposure to vinyl chloride in excess of the permissible limit and necessary protective steps;

(iii) The purpose for, proper use, and limitations of respiratory protective devices;

(iv) The fire hazard and acute toxicity of vinyl chloride, and the necessary protective steps;

(v) The purpose for and a description of the monitoring program;

(vi) The purpose for and a description of, the medical surveillance program;

(vii) Emergency procedures:

(A) Specific information to aid the employee in recognition of conditions which may result in the release of vinyl chloride; and

(B) A review of this standard at the employee's first training and indoctrination program, and annually thereafter.

(b) All materials relating to the program shall be provided upon request to the director.

(10) Medical surveillance. A program of medical surveillance shall be instituted for each employee exposed, without regard to the use of respirators, to vinyl chloride in excess of the action level. The program shall provide each such employee with an opportunity for examinations and tests in accordance with this subsection. All medical examinations and procedures shall be performed by or under the supervision of a licensed physician and shall be provided without cost to the employee.

(a) At the time of initial assignment, or upon institution of medical surveillance;

(i) A general physical examination shall be performed with specific attention to detecting enlargement of liver, spleen or kidneys, or dysfunction in these organs, and for abnormalities in skin, connective tissues and the pulmonary system (see Appendix A).

(ii) A medical history shall be taken, including the following topics:

(A) Alcohol intake,

(B) Past history of hepatitis,

(C) Work history and past exposure to potential hepatotoxic agents, including drugs and chemicals,

(D) Past history of blood transfusions, and

(E) Past history of hospitalizations.

(iii) A serum specimen shall be obtained and determinations made of:

(A) Total bilirubin,

(B) Alkaline phosphatase,

(C) Serum glutamic oxalacetic transaminase (SGOT),

(D) Serum glutamic pyruvic transaminase (SGPT), and

(E) Gamma glutamyl transpeptidase.

(b) Examinations provided in accordance with this subdivision shall be performed at least:

(i) Every 6 months for each employee who has been employed in vinyl chloride or polyvinyl chloride manufacturing for 10 years or longer; and

(ii) Annually for all other employees.

(c) Each employee exposed to an emergency shall be afforded appropriate medical surveillance.

(d) A statement of each employee's suitability for continued exposure to vinyl chloride including use of protective equipment and respirators, shall be obtained from the examining physician promptly after any examination. A copy of the physician's statement shall be provided each employee.

(e) If any employee's health would be materially impaired by continued exposure, such employee shall be withdrawn from possible contact with vinyl chloride.

(f) Laboratory analyses for all biological specimens included in medical examinations shall be performed in laboratories licensed under 42 CFR Part 74.

(g) If the examining physician determines that alternative medical examinations to those required by subdivision (a) of this subsection will provide at least equal assurance of detecting medical conditions pertinent to the exposure to vinyl chloride, the employer may accept such alternative examinations as meeting the requirements of subdivision (a)

of this subsection, if the employer obtains a statement from the examining physician setting forth the alternative examinations and the rationale for substitution. This statement shall be available upon request for examination and copying to authorized representatives of the director.

(11) Signs and labels.

(a) Entrances to regulated areas shall be posted with legible signs bearing the legend:

CANCER-SUSPECT AGENT AREA
AUTHORIZED PERSONNEL ONLY

(b) Areas containing hazardous operations or where an emergency currently exists shall be posted with legible signs bearing the legend:

CANCER-SUSPECT AGENT IN THIS AREA PROTECTIVE EQUIPMENT REQUIRED AUTHORIZED PERSONNEL ONLY

(c) Containers of polyvinyl chloride resin waste from reactors or other waste contaminated with vinyl chloride shall be legibly labeled:

CONTAMINATED WITH VINYL
CHLORIDE CANCER-SUSPECT AGENT

(d) Containers of polyvinyl chloride shall be legibly labeled:

POLYVINYL CHLORIDE (OR TRADE NAME) CONTAINS VINYL
CHLORIDE VINYL CHLORIDE IS A CANCER-SUSPECT AGENT

(e) Containers of vinyl chloride shall be legibly labeled either:

VINYL CHLORIDE EXTREMELY FLAMMABLE
GAS UNDER PRESSURE CANCER-SUSPECT AGENT

(or)

(f) In accordance with 49 CFR Part 173, Subpart H, with the additional legends:

CANCER-SUSPECT AGENT

Applied near the label or placard.

(g) No statement shall appear on or near any required sign, label or instruction which contradicts or detracts from the effect of any required warning, information or instruction.

(12) Records.

(a) All records maintained in accordance with this section shall include the name and social security number of each employee where relevant.

(b) Records of required monitoring and measuring and medical records shall be provided upon request to employees, designated representatives, and the director in accordance with WAC 296-62-05201 through 296-62-05209; and 296-62-05213 through 296-62-05217. These records shall be provided upon request to the director. Authorized personnel rosters shall also be provided upon request to the director.

(i) Monitoring and measuring records shall:

(A) State the date of such monitoring and measuring and the concentrations determined and identify the instruments and methods used;

(B) Include any additional information necessary to determine individual employee exposures where such exposures are determined by means other than individual monitoring of employees; and

(C) Be maintained for not less than 30 years.

(ii) Medical records shall be maintained for the duration of the employment of each employee plus 20 years, or 30 years, whichever is longer.

(c) In the event that the employer ceases to do business and there is no successor to receive and retain his/her records for the prescribed period, these records shall be transmitted by registered mail to the director, and each employee individually notified in writing of this transfer. The employer shall also comply with any additional requirements set forth in WAC 296-62-05215.

(d) Employees or their designated representatives shall be provided access to examine and copy records of required monitoring and measuring.

(e) Former employees shall be provided access to examine and copy required monitoring and measuring records reflecting their own exposures.

(f) Upon written request of any employee, a copy of the medical record of that employee shall be furnished to any physician designated by the employee.

(13) Reports.

(a) Not later than 1 month after the establishment of a regulated area, the following information shall be reported to the director. Any changes to such information shall be reported within 15 days.

(i) The address and location of each establishment which has one or more regulated areas; and

(ii) The number of employees in each regulated area during normal operations, including maintenance.

(b) Emergencies and the facts obtainable at that time, shall be reported within 24 hours to the director. Upon request of the director, the employer shall submit additional information in writing relevant to the nature and extent of employee exposures and measures taken to prevent future emergencies of similar nature.

(c) Within 10 working days following any monitoring and measuring which discloses that any employee has been exposed, without regard to the use of respirators, in excess of the permissible exposure limit, each such employee shall be notified in writing of the results of the exposure measurement and the steps being taken to reduce the exposure to within the permissible exposure limit.

(14) Appendix A supplementary medical information.

When required tests under subsection (10)(a) of this section show abnormalities, the tests should be repeated as soon as practicable, preferably within 3 to 4 weeks. If tests remain abnormal, consideration should be given to withdrawal of the employee from contact with vinyl chloride, while a more comprehensive examination is made.

Additional tests which may be useful:

(A) For kidney dysfunction: Urine examination for albumin, red blood cells, and exfoliative abnormal cells.

(B) Pulmonary system: Forced vital capacity, forced expiratory volume at 1 second, and chest roentgenogram (posterior-anterior, 14 x 17 inches).

(C) Additional serum tests: Lactic acid dehydrogenase, lactic acid dehydrogenase isoenzyme, protein determination, and protein electrophoresis.

(D) For a more comprehensive examination on repeated abnormal serum tests: Hepatitis B antigen, and liver scanning.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07329, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07329, filed 7/20/94, effective 9/20/94; 91-03-044 (Order 90-18), § 296-62-07329, filed 1/10/91, effective 2/12/91. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-07329, filed 7/25/86; 82-13-045 (Order 82-22), § 296-62-07329, filed 6/11/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-07329, filed 8/27/81; 81-16-015 (Order 81-20), § 296-62-07329, filed 7/27/81; Order 75-41, § 296-62-07329, filed 12/19/75.]

WAC 296-62-07336 Acrylonitrile. (1) Scope and application.

(a) This section applies to all occupational exposure to acrylonitrile (AN), Chemical Abstracts Service Registry No. 000107131, except as provided in (b) and (c) of this subsection.

(b) This section does not apply to exposures which result solely from the processing, use, and handling of the following materials:

(i) ABS resins, SAN resins, nitrile barrier resins, solid nitrile elastomers, and acrylic and modacrylic fibers, when these listed materials are in the form of finished polymers, and products fabricated from such finished polymers;

(ii) Materials made from and/or containing AN for which objective data is reasonably relied upon to demonstrate that the material is not capable of releasing AN in airborne concentrations in excess of 1 ppm as an eight-hour time-weighted average, under the expected conditions of processing, use, and handling which will cause the greatest possible release; and

(iii) Solid materials made from and/or containing AN which will not be heated above 170°F during handling, use, or processing.

(c) An employer relying upon exemption under (1)(b)(ii) shall maintain records of the objective data supporting that exemption, and of the basis of the employer's reliance on the data as provided in subsection (17) of this section.

(2) Definitions, as applicable to this section:

(a) "Acrylonitrile" or "AN" - acrylonitrile monomer, chemical formula $\text{CH}_2=\text{CHCN}$.

(b) "Action level" - a concentration of AN of 1 ppm as an eight-hour time-weighted average.

(c) "Authorized person" - any person specifically authorized by the employer whose duties require the person to enter a regulated area, or any person entering such an area as a designated representative of employees for the purpose of exercising the opportunity to observe monitoring procedures under subsection (18) of this section.

(d) "Decontamination" means treatment of materials and surfaces by water washdown, ventilation, or other means, to assure that the materials will not expose employees to airborne concentrations of AN above 1 ppm as an eight-hour time-weighted average.

(e) "Director" - the director of labor and industries, or his authorized representative.

(f) "Emergency" - any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment, which is likely to, or does, result in unexpected exposure to AN in excess of the ceiling limit.

(g) "Liquid AN" means AN monomer in liquid form, and liquid or semiliquid polymer intermediates, including slurries, suspensions, emulsions, and solutions, produced during the polymerization of AN.

(h) "Polyacrylonitrile" or "PAN" - polyacrylonitrile homopolymers or copolymers, except for materials as exempted under subsection (1)(b) of this section.

(3) Permissible exposure limits.

(a) Inhalation.

(i) Time-weighted average limit (TWA). The employer shall assure that no employee is exposed to an airborne concentration of acrylonitrile in excess of two parts acrylonitrile per million parts of air (2 ppm), as an eight-hour time-weighted average.

(ii) Ceiling limit. The employer shall assure that no employee is exposed to an airborne concentration of acrylonitrile in excess of 10 ppm as averaged over any fifteen-minute period during the working day.

(b) Dermal and eye exposure. The employer shall assure that no employee is exposed to skin contact or eye contact with liquid AN or PAN.

(4) Notification of use and emergencies.

(a) Use. Within ten days of the effective date of this standard, or within fifteen days following the introduction of AN into the workplace, every employer shall report, unless he has done so pursuant to the emergency temporary standard, the following information to the director for each such workplace:

(i) The address and location of each workplace in which AN is present;

(ii) A brief description of each process of operation which may result in employee exposure to AN;

(iii) The number of employees engaged in each process or operation who may be exposed to AN and an estimate of the frequency and degree of exposure that occurs; and

(iv) A brief description of the employer's safety and health program as it relates to limitation of employee exposure to AN. Whenever there has been a significant change in the information required by this subsection, the employer shall promptly amend such information previously provided to the director.

(b) Emergencies and remedial action. Emergencies, and the facts obtainable at that time, shall be reported within 24 hours of the initial occurrence to the director. Upon request of the director, the employer shall submit additional information in writing relevant to the nature and extent of employee exposures and measures taken to prevent future emergencies of a similar nature.

(5) Exposure monitoring.

(a) General.

(i) Determinations of airborne exposure levels shall be made from air samples that are representative of each employee's exposure to AN over an eight-hour period.

(ii) For the purposes of this section, employee exposure is that which would occur if the employee were not using a respirator.

(b) Initial monitoring. Each employer who has a place of employment in which AN is present shall monitor each such workplace and work operation to accurately determine the airborne concentrations of AN to which employees may be exposed. Such monitoring may be done on a representative basis, provided that the employer can demonstrate that the determinations are representative of employee exposures.

(c) Frequency.

(i) If the monitoring required by this section reveals employee exposure to be below the action level, the employer may discontinue monitoring for that employee. The employer shall continue these quarterly measurements until at least two consecutive measurements taken at least seven days apart, are below the action level, and thereafter the employer may discontinue monitoring for that employee.

(ii) If the monitoring required by this section reveals employee exposure to be at or above the action level but below the permissible exposure limits, the employer shall repeat such monitoring for each such employee at least quarterly.

(iii) If the monitoring required by this section reveals employee exposure to be in excess of the permissible exposure limits, the employer shall repeat these determinations for each such employee at least monthly. The employer shall continue these monthly measurements until at least two consecutive measurements, taken at least seven days apart, are below the permissible exposure limits, and thereafter the employer shall monitor at least quarterly.

(d) Additional monitoring. Whenever there has been a production, process, control or personnel change which may result in new or additional exposure to AN, or whenever the employer has any other reason to suspect a change which may result in new or additional exposures to AN, additional monitoring which complies with this subsection shall be conducted.

(e) Employee notification.

(i) Within five working days after the receipt of monitoring results, the employer shall notify each employee in writing of the results which represent that employee's exposure.

(ii) Whenever the results indicate that the representative employee exposure exceeds the permissible exposure limits, the employer shall include in the written notice a statement that the permissible exposure limits were exceeded and a description of the corrective action being taken to reduce exposure to or below the permissible exposure limits.

(f) Accuracy of measurement. The method of measurement of employee exposures shall be accurate, to a confidence level of 95 percent, to within plus or minus 25 percent for concentrations of AN at or above the permissible exposure limits, and plus or minus 35 percent for concentrations of AN between the action level and the permissible exposure limits.

(g) Weekly survey of operations involving liquid AN. In addition to monitoring of employee exposures to AN as otherwise required by this subsection, the employer shall survey areas of operations involving liquid AN at least weekly to detect points where AN liquid or vapor are being released

into the workplace. The survey shall employ an infra-red gas analyzer calibrated for AN, a multipoint gas chromatographic monitor, or comparable system for detection of AN. A listing of levels detected and areas of AN release, as determined from the survey, shall be posted prominently in the workplace, and shall remain posted until the next survey is completed.

(6) Regulated areas.

(a) The employer shall establish regulated areas where AN concentrations are in excess of the permissible exposure limits.

(b) Regulated areas shall be demarcated and segregated from the rest of the workplace, in any manner that minimizes the number of persons who will be exposed to AN.

(c) Access to regulated areas shall be limited to authorized persons or to persons otherwise authorized by the act or regulations issued pursuant thereto.

(d) The employer shall assure that in the regulated area, food or beverages are not present or consumed, smoking products are not present or used, and cosmetics are not applied, (except that these activities may be conducted in the lunchrooms, change rooms and showers required under subsections (13)(a)-(13)(c) of this section.

(7) Methods of compliance.

(a) Engineering and work practice controls.

(i) The employer shall institute engineering or work practice controls to reduce and maintain employee exposures to AN, to or below the permissible exposure limits, except to the extent that the employer establishes that such controls are not feasible.

(ii) Wherever the engineering and work practice controls which can be instituted are not sufficient to reduce employee exposures to or below the permissible exposure limits, the employer shall nonetheless use them to reduce exposures to the lowest levels achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of subsection (8) of this section.

(b) Compliance program.

(i) The employer shall establish and implement a written program to reduce employee exposures to or below the permissible exposure limits solely by means of engineering and work practice controls, as required by subsection (7)(a) of this section.

(ii) Written plans for these compliance programs shall include at least the following:

(A) A description of each operation or process resulting in employee exposure to AN above the permissible exposure limits;

(B) Engineering plans and other studies used to determine the controls for each process;

(C) A report of the technology considered in meeting the permissible exposure limits;

(D) A detailed schedule for the implementation of engineering or work practice controls; and

(E) Other relevant information.

(iii) The employer shall complete the steps set forth in the compliance program by the dates in the schedule.

(iv) Written plans for such a program shall be submitted upon request to the director, and shall be available at the

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worksite for examination and copying by the director, or any affected employee or representative.

(v) The plans required by this subsection shall be revised and updated at least every six months to reflect the current status of the program.

(8) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls;

(ii) Work operations, such as maintenance and repair activities or reactor cleaning, for which the employer establishes that engineering and work-practice controls are not feasible;

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limits;

(iv) In emergencies.

(b) Respirator program.

The employer must implement a respiratory protection program in accordance with chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(c) Respirator selection. The employer must select the appropriate respirator from Table I of this subsection.

TABLE I

RESPIRATORY PROTECTION FOR ACRYLONITRILE (AN)

Concentration of AN or Condition of Use		Respirator Type
(a)	Less than or equal to 25 x permissible exposure limits.	(i) Any Type C supplied air respirator.
(b)	Less than or equal to 100 x permissible exposure limits.	(i) Any supplied air respirator with full facepiece; or
		(ii) Any self-contained breathing apparatus with full facepiece.
(c)	Less than or equal to 250 x permissible exposure limits	(i) Supplied air respirator in positive pressure mode with full facepiece, helmet, hood, or suit.
(d)	Greater than 250 x permissible exposure limits.	(i) Supplied air respirator with full facepiece and an auxiliary self-contained air supply, operated in pressure demand mode; or
		(ii) Open circuit self-contained breathing apparatus with full facepiece in positive pressure mode.
(e)	Emergency entry into unknown concentration or firefighting	(i) Any self-contained breathing apparatus with full facepiece in positive pressure mode.
(f)	Escape.	(i) Any organic vapor gas mask; or
		(ii) Any self-contained breathing.

(9) Emergency situations.

(a) Written plans.

(i) A written plan for emergency situations shall be developed for each workplace where AN is present. Appropriate portions of the plan shall be implemented in the event of an emergency.

(ii) The plan shall specifically provide that employees engaged in correcting emergency conditions shall be equipped as required in subsection (8) of this section until the emergency is abated.

(b) Alerting employees.

(i) Where there is the possibility of employee exposure to AN in excess of the ceiling limit due to the occurrence of an emergency, a general alarm shall be installed and maintained to promptly alert employees of such occurrences.

(ii) Employees not engaged in correcting the emergency shall be evacuated from the area and shall not be permitted to return until the emergency is abated.

(10) Protective clothing and equipment.

(a) Provision and use. Where eye or skin contact with liquid AN or PAN may occur, the employer shall provide at no cost to the employee, and assure that employees wear, appropriate protective clothing or other equipment in accordance with WAC 296-24-07501 and 296-24-07801 to protect any area of the body which may come in contact with liquid AN or PAN.

(b) Cleaning and replacement.

(i) The employer shall clean, launder, maintain, or replace protective clothing and equipment required by this subsection, as needed to maintain their effectiveness. In addition, the employer shall provide clean protective clothing and equipment at least weekly to each affected employee.

(ii) The employer shall assure that impermeable protective clothing which contacts or is likely to have contacted liquid AN shall be decontaminated before being removed by the employee.

(iii) The employer shall assure that AN- or PAN-contaminated protective clothing and equipment is placed and stored in closable containers which prevent dispersion of the AN or PAN outside the container.

(iv) The employer shall assure that an employee whose nonimpermeable clothing becomes wetted with liquid AN shall immediately remove that clothing and proceed to shower. The clothing shall be decontaminated before it is removed from the regulated area.

(v) The employer shall assure that no employee removes AN- or PAN-contaminated protective equipment or clothing from the change room, except for those employees authorized to do so for the purpose of laundering, maintenance, or disposal.

(vi) The employer shall inform any person who launders or cleans AN- or PAN-contaminated protective clothing or equipment of the potentially harmful effects of exposure to AN.

(vii) The employer shall assure that containers of contaminated protective clothing and equipment which are to be removed from the workplace for any reason are labeled in accordance with subsection (16)(c)(ii) of this section, and that such labels remain affixed when such containers leave the employer's workplace.

(11) Housekeeping.

(a) All surfaces shall be maintained free of accumulations of liquid AN and of PAN.

(b) For operations involving liquid AN, the employer shall institute a program for detecting leaks and spills of liquid AN, including regular visual inspections.

(c) Where spills of liquid AN are detected, the employer shall assure that surfaces contacted by the liquid AN are decontaminated. Employees not engaged in decontamination activities shall leave the area of the spill, and shall not be permitted in the area until decontamination is completed.

(d) Liquids. Where AN is present in a liquid form, or as a resultant vapor, all containers or vessels containing AN shall be enclosed to the maximum extent feasible and tightly covered when not in use, with adequate provision made to avoid any resulting potential explosion hazard.

(e) Surfaces.

(i) Dry sweeping and the use of compressed air for the cleaning of floors and other surfaces where AN and PAN are found is prohibited.

(ii) Where vacuuming methods are selected, either portable units or a permanent system may be used.

(A) If a portable unit is selected, the exhaust shall be attached to the general workplace exhaust ventilation system or collected within the vacuum unit, equipped with high efficiency filters or other appropriate means of contaminant removal, so that AN is not reintroduced into the workplace air; and

(B) Portable vacuum units used to collect AN may not be used for other cleaning purposes and shall be labeled as prescribed by subsection (16)(c)(ii) of this section.

(iii) Cleaning of floors and other contaminated surfaces may not be performed by washing down with a hose, unless a fine spray has first been laid down.

(12) Waste disposal. AN and PAN waste, scrap, debris, bags, containers or equipment, shall be disposed of in sealed bags or other closed containers which prevent dispersion of AN outside the container, and labeled as prescribed in subsection (16)(c)(ii) of this section.

(13) Hygiene facilities and practices. Where employees are exposed to airborne concentrations of AN above the permissible exposure limits, or where employees are required to wear protective clothing or equipment pursuant to subsection (11) of this section, or where otherwise found to be appropriate, the facilities required by WAC 296-24-12009 shall be provided by the employer for the use of those employees, and the employer shall assure that the employees use the facilities provided. In addition, the following facilities or requirements are mandated.

(a) Change rooms. The employer shall provide clean change rooms in accordance with WAC 296-24-12011.

(b) Showers.

(i) The employer shall provide shower facilities in accordance with WAC 296-24-12009(3).

(ii) In addition, the employer shall also assure that employees exposed to liquid AN and PAN shower at the end of the work shift.

(iii) The employer shall assure that, in the event of skin or eye exposure to liquid AN, the affected employee shall shower immediately to minimize the danger of skin absorption.

(c) Lunchrooms.

(i) Whenever food or beverages are consumed in the workplace, the employer shall provide lunchroom facilities which have a temperature controlled, positive pressure, filtered air supply, and which are readily accessible to employees exposed to AN above the permissible exposure limits.

(ii) In addition, the employer shall also assure that employees exposed to AN above the permissible exposure limits wash their hands and face prior to eating.

(14) Medical surveillance.

(a) General.

(i) The employer shall institute a program of medical surveillance for each employee who is or will be exposed to AN above the action level. The employer shall provide each such employee with an opportunity for medical examinations and tests in accordance with this subsection.

(ii) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician, and shall be provided without cost to the employee.

(b) Initial examinations. At the time of initial assignment, or upon institution of the medical surveillance program, the employer shall provide each affected employee an opportunity for a medical examination, including at least the following elements:

(i) A work history and medical history with special attention to skin, respiratory, and gastrointestinal systems, and those non-specific symptoms, such as headache, nausea, vomiting, dizziness, weakness, or other central nervous system dysfunctions that may be associated with acute or chronic exposure to AN.

(ii) A physical examination giving particular attention to central nervous system, gastrointestinal system, respiratory system, skin and thyroid.

(iii) A 14" x 17" posteroanterior chest x-ray.

(iv) Further tests of the intestinal tract, including fecal occult blood screening, and proctosigmoidoscopy, for all workers 40 years of age or older, and for any other affected employees for whom, in the opinion of the physician, such testing is appropriate.

(c) Periodic examinations.

(i) The employer shall provide examinations specified in this subsection at least annually for all employees specified in subsection (14)(a) of this section.

(ii) If an employee has not had the examinations prescribed in subsection (14)(b) of this section within six months of termination of employment, the employer shall make such examination available to the employee upon such termination.

(d) Additional examinations. If the employee for any reason develops signs or symptoms commonly associated with exposure to AN, the employer shall provide appropriate examination and emergency medical treatment.

(e) Information provided to the physician. The employer shall provide the following information to the examining physician:

(i) A copy of this standard and its appendices;

(ii) A description of the affected employee's duties as they relate to the employee's exposure;

(iii) The employee's representative exposure level;

(iv) The employee's anticipated or estimated exposure level (for preplacement examinations or in cases of exposure due to an emergency);

(v) A description of any personal protective equipment used or to be used; and

(vi) Information from previous medical examinations of the affected employee, which is not otherwise available to the examining physician.

(f) Physician's written opinion.

(i) The employer shall obtain a written opinion from the examining physician which shall include:

(A) The results of the medical examination and test performed;

(B) The physician's opinion as to whether the employee has any detected medical condition which would place the employee at an increased risk of material impairment of the employee's health from exposure to AN;

(C) Any recommended limitations upon the employee's exposure to AN or upon the use of protective clothing and equipment such as respirators; and

(D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(ii) The employer shall instruct the physician not to reveal in the written opinion specific findings or diagnoses unrelated to occupational exposure to AN.

(iii) The employer shall provide a copy of the written opinion to the affected employee.

(15) Employee information and training.

(a) Training program.

(i) The employer shall institute a training program for all employees where there is occupational exposure to AN and shall assure their participation in the training program.

(ii) The training program shall be provided at the time of initial assignment, or upon institution of the training program, and at least annually thereafter, and the employer shall assure that each employee is informed of the following:

(A) The information contained in Appendices A, B and C;

(B) The quantity, location, manner of use, release or storage of AN and the specific nature of operations which could result in exposure to AN, as well as any necessary protective steps;

(C) The purpose, proper use, and limitations of respirators and protective clothing;

(D) The purpose and a description of the medical surveillance program required by subsection (14) of this section;

(E) The emergency procedures developed, as required by subsection (9) of this section; and

(F) The engineering and work practice controls, their function and the employee's relationship thereto; and

(G) A review of this standard.

(b) Access to training materials.

(i) The employer shall make a copy of this standard and its appendices readily available to all affected employees.

(ii) The employer shall provide, upon request, all materials relating to the employee information and training program to the director.

(16) Signs and labels.

(a) General.

(i) The employer may use labels or signs required by other statutes, regulations, or ordinances in addition to, or in combination with, signs and labels required by this subsection.

(ii) The employer shall assure that no statement appears on or near any sign or label, required by this subsection, which contradicts or detracts from such effects of the required sign or label.

(b) Signs.

(i) The employer shall post signs to clearly indicate all workplaces where AN concentrations exceed the permissible exposure limits. The signs shall bear the following legend:

DANGER
ACRYLONITRILE (AN)
CANCER HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS REQUIRED

(ii) The employer shall assure that signs required by this subsection are illuminated and cleaned as necessary so that the legend is readily visible.

(c) Labels.

(i) The employer shall assure that precautionary labels are affixed to all containers of AN, and to containers of PAN and products fabricated from PAN, except for those materials for which objective data is provided as to the conditions specified in subsection (1)(b) of this section. The employer shall assure that the labels remain affixed when the AN or PAN are sold, distributed or otherwise leave the employer's workplace.

(ii) The employer shall assure that the precautionary labels required by this subsection are readily visible and legible. The labels shall bear the following legend:

DANGER
CONTAINS ACRYLONITRILE (AN)
CANCER HAZARD

(17) Recordkeeping.

(a) Objective data for exempted operations.

(i) Where the processing, use, and handling of products fabricated from PAN are exempted pursuant to subsection (1)(b) of this section, the employer shall establish and maintain an accurate record of objective data reasonably relied upon in support of the exemption.

(ii) This record shall include the following information:

(A) The relevant condition in subsection (1)(b) upon which exemption is based;

(B) The source of the objective data;

(C) The testing protocol, results of testing, and/or analysis of the material for the release of AN;

(D) A description of the operation exempted and how the data supports the exemption; and

(E) Other data relevant to the operations, materials, and processing covered by the exemption.

(iii) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

(b) Exposure monitoring.

(i) The employer shall establish and maintain an accurate record of all monitoring required by subsection (5) of this section.

(ii) This record shall include:

(A) The dates, number, duration, and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure;

(B) A description of the sampling and analytical methods used and the data relied upon to establish that the methods used meet the accuracy and precision requirements of subsection (5)(f) of this section;

(C) Type of respiratory protective devices worn, if any; and

(D) Name, social security number and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent.

(iii) The employer shall maintain this record for at least 40 years or the duration of employment plus 20 years, whichever is longer.

(c) Medical surveillance.

(i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance as required by subsection (14) of this section.

(ii) This record shall include:

(A) A copy of the physicians' written opinions;

(B) Any employee medical complaints related to exposure to AN;

(C) A copy of the information provided to the physician as required by subsection (14)(f) of this section; and

(D) A copy of the employee's medical and work history.

(iii) The employer shall assure that this record be maintained for at least forty years or for the duration of employment plus twenty years, whichever is longer.

(d) Availability.

(i) The employer shall assure that all records required to be maintained by this section be made available upon request to the director for examination and copying.

(ii) Records required by subdivisions (a) through (c) of this subsection shall be provided upon request to employees, designated representatives, and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217. Records required by subdivision (a) of this section shall be provided in the same manner as exposure monitoring records.

(iii) The employer shall assure that employee medical records required to be maintained by this section, be made available, upon request, for examination and copying, to the affected employee or former employee, or to a physician designated by the affected employee, former employee, or designated representative.

(e) Transfer of records.

(i) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by this section.

(ii) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, these records shall be transmitted to the director.

(iii) At the expiration of the retention period for the records required to be maintained pursuant to this section, the employer shall transmit these records to the director.

(iv) The employer shall also comply with any additional requirements involving transfer of records set forth in WAC 296-62-05215.

(18) Observation of monitoring.

(a) Employee observation. The employer shall provide affected employees, or their designated representatives, an opportunity to observe any monitoring of employee exposure to AN conducted pursuant to subsection (5) of this section.

(b) Observation procedures.

(i) Whenever observation of the monitoring of employee exposure to AN requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the observer with personal protective clothing or equipment required to be worn by employees working in the area, assure the use of such clothing and equipment, and require the observer to comply with all other applicable safety and health procedures.

(ii) Without interfering with the monitoring, observers shall be entitled:

(A) To receive an explanation of the measurement procedures;

(B) To observe all steps related to the measurement of airborne concentrations of AN performed at the place of exposure; and

(C) To record the results obtained.

(19) Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligation not otherwise imposed, or to detract from any obligation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07336, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-62-07336, filed 5/11/88.]

WAC 296-62-07337 Appendix A—Substance safety data sheet for acrylonitrile. (1) Substance identification.

(a) Substance: Acrylonitrile (CH₂CHCN).

(b) Synonyms: Propenenitrile; vinyl cyanide; cyanoethylene; AN; VCN; acylon; carbacryl; fumigriant; ventox.

(c) Acrylonitrile can be found as a liquid or vapor, and can also be found in polymer resins, rubbers, plastics, polyols, and other polymers having acrylonitrile as a raw or intermediate material.

(d) AN is used in the manufacture of acrylic and modiacrylic fibers, acrylic plastics and resins, speciality polymers, nitrile rubbers, and other organic chemicals. It has also been used as a fumigant.

(e) Appearance and odor: Colorless to pale yellow liquid with a pungent odor which can only be detected at concentrations above the permissible exposure level, in a range of 13-19 parts AN per million parts of air (13-19 ppm).

(f) Permissible exposure: Exposure may not exceed either:

(i) Two parts AN per million parts of air (2 ppm) averaged over the eight-hour workday; or

(ii) Ten parts AN per million parts of air (10 ppm) averaged over any fifteen-minute period in the workday.

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(iii) In addition, skin and eye contact with liquid AN is prohibited.

(2) Health hazard data.

(a) Acrylonitrile can affect your body if you inhale the vapor (breathing), if it comes in contact with your eyes or skin, or if you swallow it. It may enter your body through your skin.

(b) Effects of overexposure:

(i) Short-term exposure: Acrylonitrile can cause eye irritation, nausea, vomiting, headache, sneezing, weakness, and light-headedness. At high concentrations, the effects of exposure may go on to loss of consciousness and death. When acrylonitrile is held in contact with the skin after being absorbed into shoe leather or clothing, it may produce blisters following several hours of no apparent effect. Unless the shoes or clothing are removed immediately and the area washed, blistering will occur. Usually there is no pain or inflammation associated with blister formation.

(ii) Long-term exposure: Acrylonitrile has been shown to cause cancer in laboratory animals and has been associated with higher incidences of cancer in humans. Repeated or prolonged exposure of the skin to acrylonitrile may produce irritation and dermatitis.

(iii) Reporting signs and symptoms: You should inform your employer if you develop any signs or symptoms and suspect they are caused by exposure to acrylonitrile.

(3) Emergency first aid procedures.

(a) Eye exposure: If acrylonitrile gets into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

(b) Skin exposure: If acrylonitrile gets on your skin, immediately wash the contaminated skin with water. If acrylonitrile soaks through your clothing, especially your shoes, remove the clothing immediately and wash the skin with water. If symptoms occur after washing, get medical attention immediately. Thoroughly wash the clothing before reusing. Contaminated leather shoes or other leather articles should be discarded.

(c) Inhalation: If you or any other person breathes in large amounts of acrylonitrile, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

(d) Swallowing: When acrylonitrile has been swallowed, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

(e) Rescue: Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the location of the emergency equipment before the need arises.

(f) Special first aid procedures: First aid kits containing an adequate supply (at least two dozen) of amyl nitrite pearls, each containing 0.3 ml, should be maintained at each site

where acrylonitrile is used. When a person is suspected of receiving an overexposure to acrylonitrile, immediately remove that person from the contaminated area using established rescue procedures. Contaminated clothing must be removed and the acrylonitrile washed from the skin immediately. Artificial respiration should be started at once if breathing has stopped. If the person is unconscious, amyl nitrite may be used as an antidote by a properly trained individual in accordance with established emergency procedures. Medical aid should be obtained immediately.

(4) Respirators and protective clothing.

(a) Respirators: You may be required to wear a respirator for nonroutine activities, in emergencies, while your employer is in the process of reducing acrylonitrile exposures through engineering controls, and in areas where engineering controls are not feasible. If respirators are worn, they must have a label issued by the National Institute for Occupational Safety and Health under the provisions of 42 CFR part 84 stating that the respirators have been certified for use with organic vapors. For effective protection, respirators must fit your face and head snugly. Respirators should not be loosened or removed in work situations where their use is required.

(b) Supplied-air suits: In some work situations, the wearing of supplied-air suits may be necessary. Your employer must instruct you in their proper use and operation.

(c) Protective clothing:

(i) You must wear impervious clothing, gloves, face shield, or other appropriate protective clothing to prevent skin contact with liquid acrylonitrile. Where protective clothing is required, your employer is required to provide clean garments to you as necessary to assume that the clothing protects you adequately.

(ii) Replace or repair impervious clothing that has developed leaks.

(iii) Acrylonitrile should never be allowed to remain on the skin. Clothing and shoes which are not impervious to acrylonitrile should not be allowed to become contaminated with acrylonitrile, and if they do the clothing and shoes should be promptly removed and decontaminated. The clothing should be laundered or discarded after the AN is removed. Once acrylonitrile penetrates shoes or other leather articles, they should not be worn again.

(d) Eye protection: You must wear splashproof safety goggles in areas where liquid acrylonitrile may contact your eyes. In addition, contact lenses should not be worn in areas where eye contact with acrylonitrile can occur.

(5) Precautions for safe use, handling, and storage.

(a) Acrylonitrile is a flammable liquid, and its vapors can easily form explosive mixtures in air.

(b) Acrylonitrile must be stored in tightly closed containers in a cool, well-ventilated area, away from heat, sparks, flames, strong oxidizers (especially bromine), strong bases, copper, copper alloys, ammonia, and amines.

(c) Sources of ignition such as smoking and open flames are prohibited wherever acrylonitrile is handled, used, or stored in a manner that could create a potential fire or explosion hazard.

(d) You should use nonsparking tools when opening or closing metal containers of acrylonitrile, and containers must

be bonded and grounded when pouring or transferring liquid acrylonitrile.

(e) You must immediately remove any nonimpervious clothing that becomes wetted with acrylonitrile, and this clothing must not be reworn until the acrylonitrile is removed from the clothing.

(f) Impervious clothing wet with liquid acrylonitrile can be easily ignited. This clothing must be washed down with water before you remove it.

(g) If your skin becomes wet with liquid acrylonitrile, you must promptly and thoroughly wash or shower with soap or mild detergent to remove any acrylonitrile from your skin.

(h) You must not keep food, beverages, or smoking materials, nor are you permitted to eat or smoke in regulated areas where acrylonitrile concentrations are above the permissible exposure limits.

(i) If you contact liquid acrylonitrile, you must wash your hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

(j) Fire extinguishers and quick drenching facilities must be readily available, and you should know where they are and how to operate them.

(k) Ask your supervisor where acrylonitrile is used in your work area and for any additional plant safety and health rules.

(6) Access to information.

(a) Each year, your employer is required to inform you of the information contained in this Substance Safety Data Sheet for acrylonitrile. In addition, your employer must instruct you in the proper work practices for using acrylonitrile, emergency procedures, and the correct use of protective equipment.

(b) Your employer is required to determine whether you are being exposed to acrylonitrile. You or your representative has the right to observe employee measurements and to record the results obtained. Your employer is required to inform you of your exposure. If your employer determines that you are being overexposed, he or she is required to inform you of the actions which are being taken to reduce your exposure to within permissible exposure limits.

(c) Your employer is required to keep records of your exposures and medical examinations. These records must be kept by the employer for at least forty years or for the period of your employment plus twenty years, whichever is longer.

(d) Your employer is required to release your exposure and medical records to you or your representative upon your request.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07337, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07337, filed 7/20/94, effective 9/20/94; 88-11-021 (Order 88-04), § 296-62-07337, filed 5/11/88.]

WAC 296-62-07338 Appendix B—Substance technical guidelines for acrylonitrile. (1) Physical and chemical data.

(a) Substance identification:

(i) Synonyms: AN; VCN; vinyl cyanide; propenenitrile; cyanoethylene; Acrylon; Carbacryl; Fumigrain; Ventox.

(ii) Formula: CH₂=CHCN.

(iii) Molecular weight: 53.1.

(b) Physical data:

(i) Boiling point (760 mm Hg): 77.3°C (171°F);

(ii) Specific gravity (water=1): 0.81 (at 20°C or 68°F);

(iii) Vapor density (air=1 at boiling point of acrylonitrile): 1.83;

(iv) Melting point: -83°C (-117°F);

(v) Vapor pressure (@20°F): 83 mm Hg;

(vi) Solubility in water, percent by weight @20°C (68°F): 7.35;

(vii) Evaporation rate (Butyl Acetate=1): 4.54; and

(viii) Appearance and odor: Colorless to pale yellow liquid with a pungent odor at concentrations above the permissible exposure level. Any detectable odor of acrylonitrile may indicate overexposure.

(2) Fire, explosion, and reactivity hazard data.

(a) Fire:

(i) Flash point: -1°C (30°F) (closed cup).

(ii) Autoignition temperature: 481°C (898°F).

(iii) Flammable limits air, percent by volume: Lower: 3, Upper: 17.

(iv) Extinguishing media: Alcohol foam, carbon dioxide, and dry chemical.

(v) Special fire-fighting procedures: Do not use a solid stream of water, since the stream will scatter and spread the fire. Use water to cool containers exposed to a fire.

(vi) Unusual fire and explosion hazards: Acrylonitrile is a flammable liquid. Its vapors can easily form explosive mixtures with air. All ignition sources must be controlled where acrylonitrile is handled, used, or stored in a manner that could create a potential fire or explosion hazard. Acrylonitrile vapors are heavier than air and may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which acrylonitrile is being handled.

(vii) For purposes of compliance with the requirements of WAC 296-24-330, acrylonitrile is classified as a class IB flammable liquid. For example, 7,500 ppm, approximately one-fourth of the lower flammable limit, would be considered to pose a potential fire and explosion hazard.

(viii) For purposes of compliance with WAC 296-24-59207, acrylonitrile is classified as a Class B fire hazard.

(ix) For purpose of compliance with WAC 296-24-95613, locations classified as hazardous due to the presence of acrylonitrile shall be Class I, Group D.

(b) Reactivity:

(i) Conditions contributing to instability: Acrylonitrile will polymerize when hot, and the additional heat liberated by the polymerization may cause containers to explode. Pure AN may self-polymerize, with a rapid build-up of pressure, resulting in an explosion hazard. Inhibitors are added to the commercial product to prevent self-polymerization.

(ii) Incompatibilities: Contact with strong oxidizers (especially bromine) and strong bases may cause fires and explosions. Contact with copper, copper alloys, ammonia, and amines may start serious decomposition.

(iii) Hazardous decomposition products: Toxic gases and vapors (such as hydrogen cyanide, oxides of nitrogen, and carbon monoxide) may be released in a fire involving acrylonitrile and certain polymers made from acrylonitrile.

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(iv) Special precautions: Liquid acrylonitrile will attack some forms of plastics, rubbers, and coatings.

(3) Spill, leak, and disposal procedures.

(a) If acrylonitrile is spilled or leaked, the following steps should be taken:

(i) Remove all ignition sources.

(ii) The area should be evacuated at once and re-entered only after the area has been thoroughly ventilated and washed down with water.

(iii) If liquid acrylonitrile or polymer intermediate, collect for reclamation or absorb in paper, vermiculite, dry sand, earth, or similar material, or wash down with water into process sewer system.

(b) Persons not wearing protective equipment should be restricted from areas of spills or leaks until clean-up has been completed.

(c) Waste disposal methods: Waste materials shall be disposed of in a manner that is not hazardous to employees or to the general population. Spills of acrylonitrile and flushing of such spills shall be channeled for appropriate treatment or collection for disposal. They shall not be channeled directly into the sanitary sewer system. In selecting the method of waste disposal, applicable local, state, and federal regulations should be consulted.

(4) Monitoring and measurement procedures.

(a) Exposure above the permissible exposure limit:

(i) Eight-hour exposure evaluation: Measurements taken for the purpose of determining employee exposure under this section are best taken so that the average eight-hour exposure may be determined from a single eight-hour sample or two four-hour samples. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

(ii) Ceiling evaluation: Measurements taken for the purpose of determining employee exposure under this section must be taken during periods of maximum expected airborne concentrations of acrylonitrile in the employee's breathing zone. A minimum of three measurements should be taken on one work shift. The average of all measurements taken is an estimate of the employee's ceiling exposure.

(iii) Monitoring techniques: The sampling and analysis under this section may be performed by collecting the acrylonitrile vapor on charcoal adsorption tubes or other composition adsorption tubes, with subsequent chemical analysis. Sampling and analysis may also be performed by instruments such as real-time continuous monitoring systems, portable direct-reading instruments, or passive dosimeters. Analysis of resultant samples should be by gas chromatograph.

(iv) Appendix D lists methods of sampling and analysis which have been tested by NIOSH and OSHA for use with acrylonitrile. NIOSH and OSHA have validated modifications of NIOSH Method S-156 (see Appendix D) under laboratory conditions for concentrations below 1 ppm. The employer has the obligation of selecting a monitoring method which meets the accuracy and precision requirements of the standard under his/her unique field conditions. The standard requires that methods of monitoring must be accurate, to a 95-percent confidence level, to ± 35 -percent for concentrations of AN at or above 2 ppm, and to ± 50 -percent for concentrations below 2 ppm. In addition to the methods

described in Appendix D, there are numerous other methods available for monitoring for AN in the workplace. Details on these other methods have been submitted by various companies to the rulemaking record, and are available at the OSHA Docket Office.

(b) Since many of the duties relating to employee exposure are dependent on the results of monitoring and measuring procedures, employers shall assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

(5) Protective clothing.

(a) Employees shall be provided with and required to wear appropriate protective clothing to prevent any possibility of skin contact with liquid AN. Because acrylonitrile is absorbed through the skin, it is important to prevent skin contact with liquid AN. Protective clothing shall include impermeable coveralls or similar full-body work clothing, gloves, head-coverings, as appropriate to protect areas of the body which may come in contact with liquid AN.

(b) Employers should ascertain that the protective garments are impermeable to acrylonitrile. Nonimpermeable clothing and shoes should not be allowed to become contaminated with liquid AN. If permeable clothing does become contaminated, it should be promptly removed, placed in a regulated area for removal of the AN, and not worn again until the AN is removed. If leather footwear or other leather garments become wet from acrylonitrile, they should be replaced and not worn again, due to the ability of leather to absorb acrylonitrile and hold it against the skin. Since there is no pain associated with the blistering which may result from skin contact with liquid AN, it is essential that the employee be informed of this hazard so that he or she can be protected.

(c) Any protective clothing which has developed leaks or is otherwise found to be defective shall be repaired or replaced. Clean protective clothing shall be provided to the employee as necessary to assure its protectiveness. Whenever impervious clothing becomes wet with liquid AN, it shall be washed down with water before being removed by the employee. Employees are also required to wear splash-proof safety goggles where there is any possibility of acrylonitrile contacting the eyes.

(6) Housekeeping and hygiene facilities. For purposes of complying with WAC 296-24-120, the following items should be emphasized:

(a) The workplace should be kept clean, orderly, and in a sanitary condition. The employer is required to institute a leak and spill detection program for operations involving liquid AN in order to detect sources of fugitive AN emissions.

(b) Dry sweeping and the use of compressed air is unsafe for the cleaning of floors and other surfaces where liquid AN may be found.

(c) Adequate washing facilities with hot and cold water are to be provided, and maintained in a sanitary condition. Suitable cleansing agents are also to be provided to assure the effective removal of acrylonitrile from the skin.

(d) Change or dressing rooms with individual clothes storage facilities must be provided to prevent the contamination of street clothes with acrylonitrile. Because of the hazardous nature of acrylonitrile, contaminated protective clothing should be placed in a regulated area designated by the

employer for removal of the AN before the clothing is laundered or disposed of.

(7) Miscellaneous precautions.

(a) Store acrylonitrile in tightly-closed containers in a cool, well-ventilated area and take necessary precautions to avoid any explosion hazard.

(b) High exposures to acrylonitrile can occur when transferring the liquid from one container to another.

(c) Nonsparking tools must be used to open and close metal acrylonitrile containers. These containers must be effectively grounded and bonded prior to pouring.

(d) Never store uninhibited acrylonitrile.

(e) Acrylonitrile vapors are not inhibited.

They may form polymers and clog vents of storage tanks.

(f) Use of supplied-air suits or other impervious coverings may be necessary to prevent skin contact with and provide respiratory protection from acrylonitrile where the concentration of acrylonitrile is unknown or is above the ceiling limit. Supplied-air suits should be selected, used, and maintained under the immediate supervision of persons knowledgeable in the limitations and potential life-endangering characteristics of supplied-air suits.

(g) Employers shall advise employees of all areas and operations where exposure to acrylonitrile could occur.

(8) Common operations. Common operations in which exposure to acrylonitrile is likely to occur include the following: Manufacture of the acrylonitrile monomer; synthesis of acrylic fibers, ABS, SAN, and nitrile barrier plastics and resins, nitrile rubber, surface coatings, specialty chemicals; use as a chemical intermediate; use as a fumigant; and in the cyanoethylation of cotton.

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-62-07338, filed 5/11/88.]

WAC 296-62-07339 Appendix C—Medical surveillance guidelines for acrylonitrile. (1) Route of entry.

(a) Inhalation;

(b) Skin absorption;

(c) Ingestion.

(2) Toxicology.

(a) Acrylonitrile vapor is an asphyxiant due to inhibitory action on metabolic enzyme systems. Animals exposed to 75 or 100 ppm for seven hours have shown signs of anoxia; in some animals which died at the higher level, cyanomethemoglobin was found in the blood. Two human fatalities from accidental poisoning have been reported; one was caused by inhalation of an unknown concentration of the vapor, and the other was thought to be caused by skin absorption or inhalation. Most cases of intoxication from industrial exposure have been mild, with rapid onset of eye irritation, headache, sneezing, and nausea. Weakness, lightheadedness, and vomiting may also occur. Exposure to high concentrations may produce profound weakness, asphyxia, and death. The vapor is a severe eye irritant. Prolonged skin contact [contact] with the liquid may result in absorption with systemic effects, and in the formation of large blisters after a latent period of several hours. Although there is usually little or no pain or inflammation, the affected skin resembles a second-degree thermal burn. Solutions spilled on exposed skin, or on areas covered only by a light layer of clothing, evaporate rapidly,

leaving no irritation, or, at the most, mild transient redness. Repeated spills on exposed skin may result in dermatitis due to solvent effects.

(b) Results after one year of a planned two-year animal study on the effects of exposure to acrylonitrile have indicated that rats ingesting as little as 35 ppm in their drinking water develop tumors of the central nervous system. The interim results of this study have been supported by a similar study being conducted by the same laboratory, involving exposure of rats by inhalation of acrylonitrile vapor, which has shown similar types of tumors in animals exposed to 80 ppm.

(c) In addition, the preliminary results of an epidemiological study being performed by duPont on a cohort of workers in their Camden, S.C. acrylic fiber plant indicate a statistically significant increase in the incidence of colon and lung cancers among employees exposed to acrylonitrile.

(3) Signs and symptoms of acute overexposure. Asphyxia and death can occur from exposure to high concentrations of acrylonitrile. Symptoms of overexposure include eye irritation, headache, sneezing, nausea and vomiting, weakness, and light-headedness. Prolonged skin contact can cause blisters on the skin with appearance of a second-degree burn, but with little or no pain. Repeated skin contact may produce scaling dermatitis.

(4) Treatment of acute overexposure. Remove employee from exposure. Immediately flush eyes with water and wash skin with soap or mild detergent and water. If AN has been swallowed, and person is conscious, induce vomiting. Give artificial respiration if indicated. More severe cases, such as those associated with loss of consciousness, may be treated by the intravenous administration of sodium nitrite, followed by sodium thiosulfate, although this is not as effective for acrylonitrile poisoning as for inorganic cyanide poisoning.

(5) Surveillance and preventive considerations.

(a) As noted above, exposure to acrylonitrile has been linked to increased incidence of cancers of the colon and lung in employees of the duPont acrylic fiber plant in Camden, S.C. In addition, the animal testing of acrylonitrile has resulted in the development of cancers of the central nervous system in rats exposed by either inhalation or ingestion. The physician should be aware of the findings of these studies in evaluating the health of employees exposed to acrylonitrile.

(b) Most reported acute effects of occupational exposure to acrylonitrile are due to its ability to cause tissue anoxia and asphyxia. The effects are similar to those caused by hydrogen cyanide. Liquid acrylonitrile can be absorbed through the skin upon prolonged contact. The liquid readily penetrates leather, and will produce burns of the feet if footwear contaminated with acrylonitrile is not removed.

(c) It is important for the physician to become familiar with the operating conditions in which exposure to acrylonitrile may occur. Those employees with skin diseases may not tolerate the wearing of whatever protective clothing may be necessary to protect them from exposure. In addition, those with chronic respiratory disease may not tolerate the wearing of negative-pressure respirators.

(d) Surveillance and screening. Medical histories and laboratory examinations are required for each employee subject to exposure to acrylonitrile above the action level. The

employer must screen employees for history of certain medical conditions which might place the employee at increased risk from exposure.

(i) Central nervous system dysfunction. Acute effects of exposure to acrylonitrile generally involve the central nervous system. Symptoms of acrylonitrile exposure include headache, nausea, dizziness, and general weakness. The animal studies cited above suggest possible carcinogenic effects of acrylonitrile on the central nervous system, since rats exposed by either inhalation or ingestion have developed similar CNS tumors.

(ii) Respiratory disease. The duPont data indicate an increased risk of lung cancer among employees exposed to acrylonitrile.

(iii) Gastrointestinal disease. The duPont data indicate an increased risk of cancer of the colon among employees exposed to acrylonitrile. In addition, the animal studies show possible tumor production in the stomachs of the rats in the ingestion study.

(iv) Skin disease. Acrylonitrile can cause skin burns when prolonged skin contact with the liquid occurs. In addition, repeated skin contact with the liquid can cause dermatitis.

(e) General. The purpose of the medical procedures outlined in the standard is to establish a baseline for future health monitoring. Persons unusually susceptible to the effects of anoxia or those with anemia would be expected to be at increased risk. In addition to emphasis on the CNS, respiratory and gastro-intestinal systems, the cardiovascular system, liver, and kidney function should also be stressed.

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-62-07339, filed 5/11/88.]

WAC 296-62-07340 Appendix D—Sampling and analytical methods for acrylonitrile. (1) There are many methods available for monitoring employee exposures to acrylonitrile. Most of these involve the use of charcoal tubes and sampling pumps, with analysis by gas chromatograph. The essential differences between the charcoal tube methods include, among others, the use of different desorbing solvents, the use of different lots of charcoal, and the use of different equipment for analysis of the samples.

(2) Besides charcoal, considerable work has been performed on methods using porous polymer sampling tubes and passive dosimeters. In addition, there are several portable gas analyzers and monitoring units available on the open market.

(3) This appendix contains details for the methods which have been tested at OSHA Analytical Laboratory in Salt Lake City, and NIOSH in Cincinnati. Each is a variation on NIOSH Method S-156, which is also included for reference. This does not indicate that these methods are the only ones which will be satisfactory. There also may be workplace situations in which these methods are not adequate, due to such factors as high humidity. Copies of the other methods available to OSHA are available in the rulemaking record, and may be obtained from the OSHA docket office. These include, the Union Carbide, Monsanto, Dow Chemical and Dow Badische methods, as well as NIOSH Method P & CAM 127.

(4) Employers who note problems with sample breakthrough should try larger charcoal tubes. Tubes of larger capacity are available, and are often used for sampling vinyl chloride. In addition, lower flow rates and shorter sampling times should be beneficial in minimizing breakthrough problems.

(5) Whatever method the employer chooses, he must assure himself of the method's accuracy and precision under the unique conditions present in his workplace.

(6) NIOSH Method S-156 (unmodified)

Analyte: Acrylonitrile.

Matrix: Air.

Procedure: Absorption on charcoal, desorption with methanol, GC.

(a) Principle of the method. Reference (k)(i) of this subsection.

(i) A known volume of air is drawn through a charcoal tube to trap the organic vapors present.

(ii) The charcoal in the tube is transferred to a small, stoppered sample container, and the analyte is desorbed with methanol.

(iii) An aliquot of the desorbed sample is injected into a gas chromatograph.

(iv) The area of the resulting peak is determined and compared with areas obtained for standards.

(b) Range and sensitivity.

(i) This method was validated over the range of 17.5-70.0 mg/cu m at an atmospheric temperature and pressure of 22°C and 760 mm Hg, using a twenty-liter sample. Under the conditions of sample size (20 liters) the probable useful range of this method is 4.5-135 mg/cu m. The method is capable of measuring much smaller amounts if the desorption efficiency is adequate. Desorption efficiency must be determined over the range used.

(ii) The upper limit of the range of the method is dependent on the adsorptive capacity of the charcoal tube. This capacity varies with the concentrations of acrylonitrile and other substances in the air. The first section of the charcoal tube was found to hold at least 3.97 mg of acrylonitrile when a test atmosphere containing 92.0 mg/cu m of acrylonitrile in air was sampled 0.18 liter per minute for 240 minutes; at that time the concentration of acrylonitrile in the effluent was less than 5 percent of that in the influent. (The charcoal tube consists of two sections of activated charcoal separated by a section of urethane foam. See (f)(ii) of this subsection. If a particular atmosphere is suspected of containing a large amount of contaminant, a smaller sampling volume should be taken.

(c) Interference.

(i) When the amount of water in the air is so great that condensation actually occurs in the tube, organic vapors will not be trapped efficiently. Preliminary experiments using toluene indicate that high humidity severely decreases the breakthrough volume.

(ii) When interfering compounds are known or suspected to be present in the air, such information, including their suspected identities, should be transmitted with the sample.

(iii) It must be emphasized that any compound which has the same retention time as the analyte at the operating conditions described in this method is an interference. Retention

time data on a single column cannot be considered proof of chemical identity.

(iv) If the possibility of interference exists, separation conditions (column packing, temperature, etc.) must be changed to circumvent the problem.

(d) Precision and accuracy.

(i) The coefficient of variation (CV) for the total analytical and sampling method in the range of 17.5-70.0 mg/cu m was 0.073. This value corresponds to a 3.3 mg/cu m standard deviation at the (previous) OSHA standard level (20 ppm). Statistical information and details of the validation and experimental test procedures can be found in (k)(ii) of this subsection.

(ii) On the average the concentrations obtained at the 20 ppm level using the overall sampling and analytical method were 6.0 percent lower than the "true" concentrations for a limited number of laboratory experiments. Any difference between the "found" and "true" concentrations may not represent a bias in the sampling and analytical method, but rather a random variation from the experimentally determined "true" concentration. Therefore, no recovery correction should be applied to the final result in (j)(v) of this subsection.

(e) Advantages and disadvantages of the method.

(i) The sampling device is small, portable, and involves no liquids. Interferences are minimal, and most of those which do occur can be eliminated by altering chromatographic conditions. The tubes are analyzed by means of a quick, instrumental method.

(ii) The method can also be used for the simultaneous analysis of two or more substances suspected to be present in the same sample by simply changing gas chromatographic conditions.

(iii) One disadvantage of the method is that the amount of sample which can be taken is limited by the number of milligrams that the tube will hold before overloading. When the sample value obtained for the backup section of the charcoal tube exceeds 25 percent of that found on the front section, the possibility of sample loss exists.

(iv) Furthermore, the precision of the method is limited by the reproducibility of the pressure drop across the tubes. This drop will affect the flow rate and cause the volume to be imprecise, because the pump is usually calibrated for one tube only.

(f) Apparatus.

(i) A calibrated personal sampling pump whose flow can be determined within ± 5 percent at the recommended flow rate. Reference (k)(iii) of this subsection.

(ii) Charcoal tubes: Glass tubes with both ends flame sealed, 7 cm long with a 6 mm O.D. and a 4 mm I.D., containing 2 sections of 20/40 mesh activated charcoal separated by a 2 mm portion of urethane foam. The activated charcoal is prepared from coconut shells and is fired at 600°C prior to packing. The adsorbing section contains 100 mg of charcoal, the backup section 50 mg. A 3 mm portion of urethane foam is placed between the outlet end of the tube and the backup section. A plug of silicated glass wool is placed in front of the adsorbing section. The pressure drop across the tube must be less than 1 inch of mercury at a flow rate of 1 liter per minute.

(iii) Gas chromatograph equipped with a flame ionization detector.

(iv) Column (4 ft × 1/4 in stainless steel) packed with 50/80 mesh Poropak, type Q.

(v) An electronic integrator or some other suitable method for measuring peak areas.

(vi) Two-milliliter sample containers with glass stoppers or Teflon-lined caps. If an automatic sample injector is used, the associated vials may be used.

(vii) Microliter syringes: Ten-microliter and other convenient sizes for making standards.

(viii) Pipets: 1.0 ml delivery pipets.

(ix) Volumetric flask: 10 ml or convenient sizes for making standard solutions.

(g) Reagents.

(i) Chromatographic quality methanol.

(ii) Acrylonitrile, reagent grade.

(iii) Hexane, reagent grade.

(iv) Purified nitrogen.

(v) Prepurified hydrogen.

(vi) Filtered compressed air.

(h) Procedure.

(i) Cleaning of equipment. All glassware used for the laboratory analysis should be detergent washed and thoroughly rinsed with tap water and distilled water.

(ii) Calibration of personal pumps. Each personal pump must be calibrated with a representative charcoal tube in the line. This will minimize errors associated with uncertainties in the sample volume collected.

(iii) Collection and shipping of samples.

(A) Immediately before sampling, break the ends of the tube to provide an opening at least one-half the internal diameter of the tube (2mm).

(B) The smaller section of charcoal is used as a backup and should be positioned nearest the sampling pump.

(C) The charcoal tube should be placed in a vertical direction during sampling to minimize channeling through the charcoal.

(D) Air being sampled should not be passed through any hose or tubing before entering the charcoal tube.

(E) A maximum sample size of 20 liters is recommended. Sample at a flow of 0.20 liter per minute or less. The flow rate should be known with an accuracy of at least ±5 percent.

(F) The temperature and pressure of the atmosphere being sampled should be recorded. If pressure reading is not available, record the elevation.

(G) The charcoal tubes should be capped with the supplied plastic caps immediately after sampling. Under no circumstances should rubber caps be used.

(H) With each batch of ten samples submit one tube from the same lot of tubes which was used for sample collection and which is subjected to exactly the same handling as the samples except that no air is drawn through it. Label this as a blank.

(I) Capped tubes should be packed tightly and padded before they are shipped to minimize tube breakage during shipping.

(J) A sample of the bulk material should be submitted to the laboratory in a glass container with a Teflon-lined cap.

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This sample should not be transported in the same container as the charcoal tubes.

(iv) Analysis of samples.

(A) Preparation of samples. In preparation for analysis, each charcoal tube is scored with a file in front of the first section of charcoal and broken open. The glass wool is removed and discarded. The charcoal in the first (larger) section is transferred to a 2 ml stoppered sample container. The separating section of foam is removed and discarded; the second section is transferred to another stoppered container. These two sections are analyzed separately.

(B) Desorption of samples. Prior to analysis, 1.0 ml of methanol is pipetted into each sample container. Desorption should be done for 30 minutes. Tests indicate that this is adequate if the sample is agitated occasionally during this period. If an automatic sample injector is used, the sample vials should be capped as soon as the solvent is added to minimize volatilization.

(C) GC conditions. The typical operating conditions for the gas chromatograph are:

(I) 50 ml/min (60 psig) nitrogen carrier gas flow.

(II) 65 ml/min (24 psig) hydrogen gas flow to detector.

(III) 500 ml/min (50 psig) air flow to detector.

(IV) 235°C injector temperature.

(V) 255°C manifold temperature (detector).

(VI) 155°C column temperature.

(D) Injection. The first step in the analysis is the injection of the sample into the gas chromatograph. To eliminate difficulties arising from blowback or distillation within the syringe needle, one should employ the solvent flush injection technique. The 10-microliter syringe is first flushed with solvent several times to wet the barrel and plunger. Three microliters of solvent are drawn into the syringe to increase the accuracy and reproducibility of the injected sample volume. The needle is removed from the solvent, and the plunger is pulled back about 0.2 microliter to separate the solvent flush from the sample with a pocket of air to be used as a marker. The needle is then immersed in the sample, and a five microliter aliquot is withdrawn, taking into consideration the volume of the needle, since the sample in the needle will be completely injected. After the needle is removed from the sample and prior to injection, the plunger is pulled back 1.2 microliters to minimize evaporation of the sample from the tip of the needle. Observe that the sample occupies 4.9-5.0 microliters in the barrel of the syringe. Duplicate injections of each sample and standard should be made. No more than a 3 percent difference in area is to be expected. An automatic sample injector can be used if it is shown to give reproducibility at least as good as the solvent flush method.

(E) Measurement of area. The area of the sample peak is measured by an electronic integrator or some other suitable form of area measurement, and preliminary results are read from a standard curve prepared as discussed below.

(v) Determination of desorption efficiency.

(A) Importance of determination. The desorption efficiency of a particular compound can vary from one laboratory to another and also from one batch of charcoal to another. Thus, it is necessary to determine at least once the percentage of the specific compound that is removed in the

desorption process, provided the same batch of charcoal is used.

(B) Procedure for determining desorption efficiency.

(I) Activated charcoal equivalent to the amount in the first section of the sampling tube (100 mg) is measured into a 2.5 in., 4 mm I.D. glass tube, flame sealed at one end. This charcoal must be from the same batch as that used in obtaining the samples and can be obtained from unused charcoal tubes. The open end is capped with Parafilm. A known amount of hexane solution of acrylonitrile containing 0.239 g/ml is injected directly into the activated charcoal with a microliter syringe, and tube is capped with more Parafilm. When using an automatic sample injector, the sample injector vials, capped with Teflon-faced septa, may be used in place of the glass tube.

(II) The amount injected is equivalent to that present in a twenty-liter air sample at the selected level.

(III) Six tubes at each of three levels (0.5X, 1X, and 2X of the standard) are prepared in this manner and allowed to stand for at least overnight to assure complete adsorption of the analyte onto the charcoal. These tubes are referred to as the sample. A parallel blank tube should be treated in the same manner except that no sample is added to it. The sample and blank tubes are desorbed and analyzed in exactly the same manner as the sampling tube described in (h)(iv) of this subsection

(IV) Two or three standards are prepared by injecting the same volume of compound into 1.0 ml of methanol with the same syringe used in the preparation of the samples. These are analyzed with the samples.

(V) The desorption efficiency (D.E.) equals the average weight in mg recovered from the tube divided by the weight in mg added to the tube, or

$$\text{D.E.} = \frac{\text{Average weight recovered (mg)}}{\text{weight added (mg)}}$$

(VI) The desorption efficiency is dependent on the amount of analyte collected on the charcoal. Plot the desorption efficiency versus weight of analyte found. This curve is used in (j)(iv) of this subsection to correct for adsorption losses.

(i) Calibration and standards. It is convenient to express concentration of standards in terms of mg/1.0 ml methanol, because samples are desorbed in this amount of methanol. The density of the analyte is used to convert mg into microliters for easy measurement with a microliter syringe. A series of standards, varying in concentration over the range of interest, is prepared and analyzed under the same GC conditions and during the same time period as the unknown samples. Curves are established by plotting concentration in mg/1.0 ml versus peak area.

Note: Since no internal standard is used in the method, standard solutions must be analyzed at the same time that the sample analysis is done. This will minimize the effect of known day-to-day variations and variations during the same day of the FID response.

(j) Calculations.

(i) Read the weight, in mg, corresponding to each peak area from the standard curve. No volume corrections are

needed, because the standard curve is based on mg/1.0 ml methanol and the volume of sample injected is identical to the volume of the standards injected.

(ii) Corrections for the blank must be made for each sample.

$$\text{mg} = \text{mg sample} - \text{mg blank}$$

Where:

mg sample = mg found in front section of sample tube.

mg sample = mg found in front section of blank tube.

Note: A similar procedure is followed for the backup sections.

(iii) Add the weights found in the front and backup sections to get the total weight in the sample.

(iv) Read the desorption efficiency from the curve (reference (h)(v)(B) of this subsection) for the amount found in the front section. Divide the total weight by this desorption efficiency to obtain the corrected mg/sample.

$$\text{Corrected mg/sample} = \frac{\text{Total weight}}{\text{D.E.}}$$

(v) The concentration of the analyte in the air sampled can be expressed in mg/cu m.

$$\text{mg/cu m} = \text{Corrected mg (see (j)(iv))} \times \frac{1,000 \text{ (liter/cu m)}}{\text{air volume sampled (liter)}}$$

(vi) Another method of expressing concentration is ppm.

$$\text{ppm} = \text{mg/cu m} \times 24.45/\text{M.W.} \times 760/\text{P} \times \text{T} + 273/298$$

Where:

P = Pressure (mm Hg) of air sampled.

T = Temperature (°C) of air sampled.

24.45 = Molar volume (liter/mole) at 25°C and 760 mm Hg.

M.W. = Molecular weight (g/mole) of analyte.

760 = Standard pressure (mm Hg).

298 = Standard temperature (°K).

(k) References.

(i) White, L. D. et al., "A Convenient Optimized Method for the Analysis of Selected Solvent Vapors in the Industrial Atmosphere," Amer. Ind. Hyg. Assoc. J., 31:225 (1970).

(ii) Documentation of NIOSH Validation Tests, NIOSH Contract No. CDC-99-74-45.

(iii) Final Report, NIOSH Contract HSM-99-71-31, "Personal Sampler Pump for Charcoal Tubes," September 15, 1972.

(7) NIOSH Modification of NIOSH Method S-156. The NIOSH recommended method for low levels for acrylonitrile is a modification of method S-156. It differs in the following respects:

(a) Samples are desorbed using 1 ml of 1 percent acetone in CS₂ rather than methanol.

(b) The analytical column and conditions are:

(i) Column: 20 percent SP-1000 on 80/100 Supelcoport 10 feet × 1/8 inch S.S.

(ii) Conditions:

Injector temperature: 200°C.

Detector temperature: 100°C.

Column temperature: 85°C.

Helium flow: 25 ml/min.

Air flow: 450 ml/min.

Hydrogen flow: 55 ml/min.

(c) A 2 µl injection of the desorbed analyte is used.

(d) A sampling rate of 100 ml/min is recommended.

(8) OSHA Laboratory Modification of NIOSH Method S-156.

(a) Analyte: Acrylonitrile.

(b) Matrix: Air.

(c) Procedure: Adsorption on charcoal, desorption with methanol, GC.

(d) Principle of the method (subsection (1)(a) of this section).

(i) A known volume of air is drawn through a charcoal tube to trap the organic vapors present.

(ii) The charcoal in the tube is transferred to a small, stoppered sample vial, and the analyte is desorbed with methanol.

(iii) An aliquot of the desorbed sample is injected into a gas chromatograph.

(iv) The area of the resulting peak is determined and compared with areas obtained for standards.

(e) Advantages and disadvantages of the method.

(i) The sampling device is small, portable, and involves no liquids. Interferences are minimal, and most of those which do occur can be eliminated by altering chromatographic conditions. The tubes are analyzed by means of a quick, instrumental method.

(ii) This method may not be adequate for the simultaneous analysis of two or more substances.

(iii) The amount of sample which can be taken is limited by the number of milligrams that the tube will hold before overloading. When the sample value obtained for the backup section of the charcoal tube exceeds 25 percent of that found on the front section, the possibility of sample loss exists.

(iv) The precision of the method is limited by the reproducibility of the pressure drop across the tubes. This drop will affect the flow rate and cause the volume to be imprecise, because the pump is usually calibrated for one tube only.

(f) Apparatus.

(i) A calibrated personal sampling pump whose flow can be determined within ±5 percent at the recommended flow rate.

(ii) Charcoal tubes: Glass tube with both ends flame sealed, 7 cm long with a 6 mm O.D. and a 4 mm I.D., containing 2 sections of 20/40 mesh activated charcoal separated by a 2 mm portion of urethane foam. The activated charcoal is prepared from coconut shells and is fired at 600°C prior to packing. The absorbing section contains 100 mg of charcoal, the back-up section 50 mg. A 3 mm portion of urethane foam is placed between the outlet end of the tube and the back-up section. A plug of silicated glass wool is placed in front of the adsorbing section. The pressure drop across the tube must be less than one inch of mercury at a flow rate of 1 liter per minute.

(iii) Gas chromatograph equipped with a nitrogen phosphorus detector.

(iv) Column (10 ft × 1/8 in stainless steel) packed with 100/120 Supelcoport coated with 10 percent SP 1000.

(v) An electronic integrator or some other suitable method for measuring peak area.

(vi) Two-milliliter sample vials with Teflon-lined caps.

(vii) Microliter syringes: 10 microliter, and other convenient sizes for making standards.

(viii) Pipets: 1.0 ml delivery pipets.

(ix) Volumetric flasks: Convenient sizes for making standard solutions.

(g) Reagents.

(i) Chromatographic quality methanol.

(ii) Acrylonitrile, reagent grade.

(iii) Filtered compressed air.

(iv) Purified hydrogen.

(v) Purified helium.

(h) Procedure.

(i) Cleaning of equipment. All glassware used for the laboratory analysis should be properly cleaned and free of organics which could interfere in the analysis.

(ii) Calibration of personal pumps. Each pump must be calibrated with a representative charcoal tube in the line.

(iii) Collection and shipping of samples.

(A) Immediately before sampling, break the ends of the tube to provide an opening at least one-half the internal diameter of the tube (2 mm).

(B) The smaller section of the charcoal is used as the backup and should be placed nearest the sampling pump.

(C) The charcoal should be placed in a vertical position during sampling to minimize channeling through the charcoal.

(D) Air being sampled should not be passed through any hose or tubing before entering the charcoal tube.

(E) A sample size of 20 liters is recommended. Sample at a flow rate of approximately 0.2 liters per minute. The flow rate should be known with an accuracy of at least ±5 percent.

(F) The temperature and pressure of the atmosphere being sampled should be recorded.

(G) The charcoal tubes should be capped with the supplied plastic caps immediately after sampling. Rubber caps should not be used.

(H) Submit at least one blank tube (a charcoal tube subjected to the same handling procedures, without having any air drawn through it) with each set of samples.

(I) Take necessary shipping and packing precautions to minimize breakage of samples.

(iv) Analysis of samples.

(A) Preparation of samples. In preparation for analysis, each charcoal tube is scored with a file in front of the first section of charcoal and broken open. The glass wool is removed and discarded. The charcoal in the first (larger) section is transferred to a 2 ml vial. The separating section of foam is removed and discarded; the section is transferred to another capped vial. These two sections are analyzed separately.

(B) Desorption of samples. Prior to analysis, 1.0 ml of methanol is pipetted into each sample container. Desorption should be done for 30 minutes in an ultrasonic bath. The sample vials are recapped as soon as the solvent is added.

(C) GC conditions. The typical operating conditions for the gas chromatograph are:

- (I) 30 ml/min (60 psig) helium carrier gas flow.
- (II) 3.0 ml/min (30 psig) hydrogen gas flow to detector.
- (III) 50 ml/min (60 psig) air flow to detector.
- (IV) 200°C injector temperature.
- (V) 200°C detector temperature.
- (VI) 100°C column temperature.

(D) Injection. Solvent flush technique or equivalent.

(E) Measurement of area. The area of the sample peak is measured by an electronic integrator or some other suitable form of area measurement, and preliminary results are read from a standard curve prepared as discussed below.

(v) Determination of desorption efficiency.

(A) Importance of determination. The desorption efficiency of a particular compound can vary from one laboratory to another and also from one batch of charcoal to another. Thus, it is necessary to determine, at least once, the percentage of the specific compound that is removed in the desorption process, provided the same batch of charcoal is used.

(B) Procedure for determining desorption efficiency. The reference portion of the charcoal tube is removed. To the remaining portion, amounts representing 0.5X, 1X, and 2X (X represents TLV) based on a 20 l air sample are injected onto several tubes at each level. Dilutions of acrylonitrile with methanol are made to allow injection of measurable quantities. These tubes are then allowed to equilibrate at least overnight. Following equilibration they are analyzed following the same procedure as the samples. A curve of the desorption efficiency (amt recovered/amt added) is plotted versus amount of analyte found. This curve is used to correct for adsorption losses.

(i) Calibration and standards. A series of standards, varying in concentration over the range of interest, is prepared and analyzed under the same GC conditions and during the same time period as the unknown samples. Curves are prepared by plotting concentration versus peak area.

Note: Since no internal standard is used in the method, standard solutions must be analyzed at the same time that the sample analysis is done. This will minimize the effect of known day-to-day variations and variations during the same day of the NPD response. Multiple injections are necessary.

(j) Calculations. Read the weight, corresponding to each peak area from the standard curve, correct for the blank, correct for the desorption efficiency, and make necessary air volume corrections.

(k) Reference. NIOSH Method S-156.

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-62-07340, filed 5/11/88.]

WAC 296-62-07342 1,2-Dibromo-3-chloropropane.

(1) Scope and application.

(a) This section applies to occupational exposure to 1,2-dibromo-3-chloropropane (DBCP).

(b) This section does not apply to:

- (i) Exposure to DBCP which results solely from the application and use of DBCP as a pesticide; or
- (ii) The storage, transportation, distribution or sale of DBCP in intact containers sealed in such a manner as to pre-

vent exposure to DBCP vapors or liquids, except for the requirements of subsections (11), (16) and (17) of this section.

(2) Definitions applicable to this section:

(a) "Authorized person" - any person specifically authorized by the employer and whose duties require the person to be present in areas where DBCP is present; and any person entering this area as a designated representative of employees exercising an opportunity to observe employee exposure monitoring.

(b) "DBCP" - 1,2-dibromo-3-chloropropane, Chemical Abstracts Service Registry Number 96-12-8, and includes all forms of DBCP.

(c) "Director" - the director of labor and industries, or his authorized representative.

(d) "Emergency" - any occurrence such as, but not limited to equipment failure, rupture of containers, or failure of control equipment which may, or does, result in unexpected release of DBCP.

(3) Permissible exposure limits.

(a) Inhalation.

(i) Time-weighted average limit (TWA). The employer shall assure that no employee is exposed to an airborne concentration in excess of 1 part DBCP per billion part of air (ppb) as an eight-hour time-weighted average.

(ii) Ceiling limit. The employer shall assure that no employee is exposed to an airborne concentration in excess of 5 parts DBCP per billion parts of air (ppb) as averaged over any 15 minutes during the working day.

(b) Dermal and eye exposure. The employer shall assure that no employee is exposed to eye or skin contact with DBCP.

(4) Notification of use. Within ten days of the effective date of this section or within ten days following the introduction of DBCP into the workplace, every employer who has a workplace where DBCP is present shall report the following information to the director for each such workplace:

(a) The address and location of each workplace in which DBCP is present;

(b) A brief description of each process or operation which may result in employee exposure to DBCP;

(c) The number of employees engaged in each process or operation who may be exposed to DBCP and an estimate of the frequency and degree of exposure that occurs;

(d) A brief description of the employer's safety and health program as it relates to limitation of employee exposure to DBCP.

(5) Regulated areas. The employer shall establish, within each place of employment, regulated areas wherever DBCP concentrations are in excess of the permissible exposure limit.

(a) The employer shall limit access to regulated areas to authorized persons.

(b) All employees entering or working in a regulated area shall wear respiratory protection in accordance with Table I.

(6) Exposure monitoring.

(a) General. Determinations of airborne exposure levels shall be made from air samples that are representative of each employee's exposure to DBCP over an eight-hour period.

(For the purposes of this section, employee exposure is that exposure which would occur if the employee were not using a respirator.)

(b) Initial. Each employer who has a place of employment in which DBCP is present shall monitor each workplace and work operation to accurately determine the airborne concentrations of DBCP to which employees may be exposed.

(c) Frequency.

(i) If the monitoring required by this section reveals employee exposures to be below the permissible exposure limits, the employer shall repeat these determinations at least quarterly.

(ii) If the monitoring required by this section reveals employee exposure to be in excess of the permissible exposure limits, the employer shall repeat these determinations for each such employee at least monthly. The employer shall continue these monthly determinations until at least two consecutive measurements, taken at least seven days apart, are below the permissible exposure limit, thereafter the employer shall monitor at least quarterly.

(d) Additional. Whenever there has been a production process, control or personnel change which may result in any new or additional exposure to DBCP, or whenever the employer has any other reason to suspect a change which may result in new or additional exposure to DBCP, additional monitoring which complies with subsection (6) shall be conducted.

(e) Employee notification.

(i) Within five working days after the receipt of monitoring results, the employer shall notify each employee in writing of results which represent the employee's exposure.

(ii) Whenever the results indicate that employee exposure exceeds the permissible exposure limit, the employer shall include in the written notice a statement that the permissible exposure limit was exceeded and a description of the corrective action being taken to reduce exposure to or below the permissible exposure limits.

(f) Accuracy of measurement. The method of measurement shall be accurate, to a confidence level of 95 percent, to within plus or minus 25 percent for concentrations of DBCP at or above the permissible exposure limits.

(7) Methods of compliance.

(a) Priority of compliance methods. The employer shall institute engineering and work practice controls to reduce and maintain employee exposures to DBCP at or below the permissible exposure limit, except to the extent that the employer establishes that such controls are not feasible. Where feasible engineering and work practice controls are not sufficient to reduce employee exposures to within the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest level achievable by these controls, and shall supplement them by use of respiratory protection.

(b) Compliance program.

(i) The employer shall establish and implement a written program to reduce employee exposure to DBCP to or below the permissible exposure limit solely by means of engineering and work practice controls as required by this section.

(ii) The written program shall include a detailed schedule for development and implementation of the engineering and

work practice controls. These plans shall be revised at least every six months to reflect the current status of the program.

(iii) Written plans for these compliance programs shall be submitted upon request to the director, and shall be available at the worksite for examination and copying by the director, and any affected employee or designated representative of employees.

(iv) The employer shall institute and maintain at least the controls described in his most recent written compliance program.

(8) Respiratory protection.

(a) General. For employees who are required to use respirators under this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(i) Period necessary to install or implement feasible engineering and work-practice controls;

(ii) Maintenance and repair activities for which engineering and work-practice controls are not feasible;

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limit;

(iv) Emergencies.

(b) The employer must establish, implement, and maintain a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(c) Respirator selection. The employer must select the appropriate respirator from Table I of this subsection.

TABLE I
RESPIRATORY PROTECTION FOR DBCP

Concentration Not Greater Than	Respirator Type
(a) 10 ppb:	(i) Any supplied-air respirator. (ii) Any self-contained breathing apparatus.
(b) 50 ppb:	(i) Any supplied-air respirator with full facepiece, helmet or hood. (ii) Any self-contained breathing apparatus with full facepiece.
(c) 250 ppb:	(i) A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous flow mode.
(d) 500 ppb:	(i) A Type C supplied-air respirator with full facepiece operated in pressure-demand mode with full facepiece.
(e) Greater than 500 ppb or entry into unknown concentrations:	(i) A combination respirator which includes a Type C supplied-air respirator with full facepiece operated in pressure-demand mode and an auxiliary self-contained breathing apparatus. (ii) A self-contained breathing apparatus with full facepiece operated in pressure-demand mode.
(f) Firefighting:	(i) A self-contained breathing apparatus with full facepiece operated in pressure-demand mode.

(9) Reserved.

(10) Emergency situations.

(a) Written plans.

(i) A written plan for emergency situations shall be developed for each workplace in which DBCP is present.

(ii) Appropriate portions of the plan shall be implemented in the event of an emergency.

(b) Employees engaged in correcting conditions shall be equipped as required in subsection (11) of this section until the emergency is abated.

(c) Evacuation. Employees not engaged in correcting the emergency shall be removed and restricted from the area and normal operations in the affected area shall not be resumed until the emergency is abated.

(d) Alerting employees. Where there is a possibility of employee exposure to DBCP due to the occurrence of an emergency, a general alarm shall be installed and maintained to promptly alert employees of such occurrences.

(e) Medical surveillance. For any employee exposed to DBCP in an emergency situation, the employer shall provide medical surveillance in accordance with subsection (14) of this section.

(f) Exposure monitoring.

(i) Following an emergency, the employer shall conduct monitoring which complies with subsection (6) of this section.

(ii) In workplaces not normally subject to periodic monitoring, the employer may terminate monitoring when two consecutive measurements indicate exposures below the permissible exposure limit.

(11) Protective clothing and equipment.

(a) Provision and use. Where eye or skin contact with liquid or solid DBCP may occur, employers shall provide at no cost to the employee, and assure that employees wear impermeable protective clothing and equipment in accordance with WAC 296-24-07501 and 296-24-07801 to protect the area of the body which may come in contact with DBCP.

(b) Cleaning and replacement.

(i) The employer shall clean, launder, maintain, or replace protective clothing and equipment required by this subsection to maintain their effectiveness. In addition, the employer shall provide clean protective clothing and equipment at least daily to each affected employee.

(ii) Removal and storage.

(A) The employer shall assure that employees remove DBCP contaminated work clothing only in change rooms provided in accordance with subsection (13) of this section.

(B) The employer shall assure that employees promptly remove any protective clothing and equipment which becomes contaminated with DBCP-containing liquids and solids. This clothing shall not be reworn until the DBCP has been removed from the clothing or equipment.

(C) The employer shall assure that no employee takes DBCP contaminated protective devices and work clothing out of the change room, except those employees authorized to do so for the purpose of laundering, maintenance, or disposal.

(iii) The employer shall assure that DBCP-contaminated protective work clothing and equipment is placed and stored in closed containers which prevent dispersion of DBCP outside the container.

(iv) The employer shall inform any person who launders or cleans DBCP-contaminated protective clothing or equipment of the potentially harmful effects of exposure to DBCP.

(v) The employer shall assure that the containers of contaminated protective clothing and equipment which are to be removed from the workplace for any reason are labeled in accordance with subsection (16)(c) of this section.

(vi) The employer shall prohibit the removal of DBCP from protective clothing and equipment by blowing or shaking.

(12) Housekeeping.

(a) Surfaces.

(i) All surfaces shall be maintained free of accumulations of DBCP.

(ii) Dry sweeping and the use of air for the cleaning of floors and other surfaces where DBCP dust or liquids are found is prohibited.

(iii) Where vacuuming methods are selected, either portable units or a permanent system may be used.

(A) If a portable unit is selected, the exhaust shall be attached to the general workplace exhaust ventilation system or collected within the vacuum unit, equipped with high efficiency filters or other appropriate means of contaminant removal, so that DBCP is not reintroduced into the workplace air; and

(B) Portable vacuum units used to collect DBCP may not be used for other cleaning purposes and shall be labeled as prescribed by subsection (16)(c) of this section.

(iv) Cleaning of floors and other contaminated surfaces may not be performed by washing down with a hose, unless a fine spray has first been laid down.

(b) Liquids. Where DBCP is present in a liquid form, or as a resultant vapor, all containers or vessels containing DBCP shall be enclosed to the maximum extent feasible and tightly covered when not in use.

(c) Waste disposal. DBCP waste, scrap, debris, bags, containers or equipment, shall be disposed in sealed bags or other closed containers which prevent dispersion of DBCP outside the container.

(13) Hygiene facilities and practices.

(a) Change rooms. The employer shall provide clean change rooms equipped with storage facilities for street clothes and separate storage facilities for protective clothing and equipment whenever employees are required to wear protective clothing and equipment in accordance with subsections (8), (9) and (11) of this section.

(b) Showers.

(i) The employer shall assure that employees working in the regulated area shower at the end of the work shift.

(ii) The employer shall assure that employees whose skin becomes contaminated with DBCP-containing liquids or solids immediately wash or shower to remove any DBCP from the skin.

(iii) The employer shall provide shower facilities in accordance with WAC 296-24-12009 (3)(c).

(c) Lunchrooms. The employer shall provide lunchroom facilities which have a temperature controlled, positive pressure, filtered air supply, and which are readily accessible to employees working in regulated areas.

(d) Lavatories.

(i) The employer shall assure that employees working in the regulated area remove protective clothing and wash their hands and face prior to eating.

(ii) The employer shall provide a sufficient number of lavatory facilities which comply with WAC 296-24-12009 (1) and (2).

(e) Prohibition of activities in regulated areas. The employer shall assure that, in regulated areas, food or beverages are not present or consumed, smoking products and implements are not present or used, and cosmetics are not present or applied.

(14) Medical surveillance.

(a) General. The employer shall institute a program of medical surveillance for each employee who is or will be exposed, without regard to the use of respirators, to DBCP. The employer shall provide each such employee with an opportunity for medical examinations and tests in accordance with this subsection. All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, and shall be provided without cost to the employee.

(b) Frequency and content. At the time of initial assignment, annually thereafter, and whenever exposure to DBCP occurs, the employer shall provide a medical examination for employees who work in regulated areas, which includes at least the following:

(i) A complete medical and occupational history with emphasis on reproductive history.

(ii) A complete physical examination with emphasis on the genito-urinary tract, testicle size, and body habitus including the following tests:

- (A) Sperm count;
- (B) Complete urinalysis (U/A);
- (C) Complete blood count; and
- (D) Thyroid profile.

(iii) A serum specimen shall be obtained and the following determinations made by radioimmunoassay techniques utilizing National Institutes of Health (NIH) specific antigen or one of equivalent sensitivity:

- (A) Serum multiphasic analysis (SMA 12);
- (B) Serum follicle stimulating hormone (FSH);
- (C) Serum luteinizing hormone (LH); and
- (D) Serum estrogen (females).

(iv) Any other tests deemed appropriate by the examining physician.

(c) Additional examinations. If the employee for any reason develops signs or symptoms commonly associated with exposure to DBCP, the employer shall provide the employee with a medical examination which shall include those elements considered appropriate by the examining physician.

(d) Information provided to the physician. The employer shall provide the following information to the examining physician:

- (i) A copy of this standard and its appendices;
- (ii) A description of the affected employee's duties as they relate to the employee's exposure;
- (iii) The level of DBCP to which the employee is exposed; and
- (iv) A description of any personal protective equipment used or to be used.

(e) Physician's written opinion.

(i) For each examination under this section, the employer shall obtain and provide the employee with a written opinion from the examining physician which shall include:

(A) The results of the medical tests performed;

(B) The physician's opinion as to whether the employee has any detected medical condition which would place the employee at an increased risk of material impairment of health from exposure to DBCP;

(C) Any recommended limitations upon the employee's exposure to DBCP or upon the use of protective clothing and equipment such as respirators; and

(D) A statement that the employee was informed by the physician of the results of the medical examination, and any medical conditions which require further examination or treatment.

(ii) The employer shall instruct the physician not to reveal in the written opinion specific findings or diagnoses unrelated to occupational exposure to DBCP.

(iii) The employer shall provide a copy of the written opinion to the affected employee.

(f) Emergency situations. If the employee is exposed to DBCP in an emergency situation, the employer shall provide the employee with a sperm count test as soon as practicable, or, if the employee is unable to produce a semen specimen, the hormone tests contained in subsection (14)(b) of this section. The employer shall provide these same tests three months later.

(15) Employee information and training.

(a) Training program.

(i) Within thirty days of the effective date of this standard, the employer shall institute a training program for all employees who may be exposed to DBCP and shall assure their participation in such training program.

(ii) The employer shall assure that each employee is informed of the following:

(A) The information contained in Appendices A, B and C;

(B) The quantity, location, manner of use, release or storage of DBCP and the specific nature of operations which could result in exposure to DBCP as well as any necessary protective steps;

(C) The purpose, proper use, limitations, and other training requirements covering respiratory protection as required in chapter 296-62 WAC, Part E;

(D) The purpose and description of the medical surveillance program required by subsection (14) of this section; and

(E) A review of this standard.

(b) Access to training materials.

(i) The employer shall make a copy of this standard and its appendices readily available to all affected employees.

(ii) The employer shall provide, upon request, all materials relating to the employee information and training program to the director.

(16) Signs and labels.

(a) General.

(i) The employer may use labels or signs required by other statutes, regulations, or ordinances in addition to or in

combination with, signs and labels required by this subsection.

(ii) The employer shall assure that no statement appears on or near any sign or label required by this subsection which contradicts or detracts from the required sign or label.

(b) Signs.

(i) The employer shall post signs to clearly indicate all work areas where DBCP may be present. These signs shall bear the legend:

DANGER
1,2-Dibromo-3-chloropropane

(Insert appropriate trade or common names)

CANCER HAZARD
AUTHORIZED PERSONNEL ONLY

(ii) Where airborne concentrations of DBCP exceed the permissible exposure limits, the signs shall bear the additional legend:

RESPIRATOR REQUIRED

(c) Labels.

(i) The employer shall assure that precautionary labels are affixed to all containers of DBCP and of products containing DBCP, and that the labels remain affixed when the DBCP or products containing DBCP are sold, distributed, or otherwise leave the employer's workplace. Where DBCP or products containing DBCP are sold, distributed or otherwise leave the employer's workplace bearing appropriate labels required by EPA under the regulations in 40 CFR Part 162, the labels required by this subsection need not be affixed.

(ii) The employer shall assure that the precautionary labels required by this subsection are readily visible and legible. The labels shall bear the following legend:

DANGER
1,2-Dibromo-3-chloropropane
CANCER HAZARD

(17) Recordkeeping.

(a) Exposure monitoring.

(i) The employer shall establish and maintain an accurate record of all monitoring required by subsection (6) of this section.

(ii) This record shall include:

(A) The dates, number, duration and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure;

(B) A description of the sampling and analytical methods used;

(C) Type of respiratory worn, if any; and

(D) Name, Social Security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent.

(iii) The employer shall maintain this record for at least forty years or the duration of employment plus twenty years, whichever is longer.

(b) Medical surveillance.

(i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance required by subsection (14) of this section.

(ii) This record shall include:

(A) The name and Social Security number of the employee;

(B) A copy of the physician's written opinion;

(C) Any employee medical complaints related to exposure to DBCP;

(D) A copy of the information provided the physician as required by subsection (14)(c) of this section; and

(E) A copy of the employee's medical and work history.

(iii) The employer shall maintain this record for at least forty years or the duration of employment plus twenty years, whichever is longer.

(c) Availability.

(i) The employer shall assure that all records required to be maintained by this section be made available upon request to the director for examination and copying.

(ii) Employee exposure monitoring records and employee medical records required by this subsection shall be provided upon request to employees' designated representatives and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209; and 296-62-05213 through 296-62-05217.

(d) Transfer of records.

(i) If the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by this section for the prescribed period.

(ii) If the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall transmit these records by mail to the director.

(iii) At the expiration of the retention period for the records required to be maintained under this section, the employer shall transmit these records by mail to the director.

(iv) The employer shall also comply with any additional requirements involving transfer of records set forth in WAC 296-62-05215.

(18) Observation of monitoring.

(a) Employee observation. The employer shall provide affected employees, or their designated representatives, an opportunity to observe any monitoring of employee exposure to DBCP conducted under subsection (6) of this section.

(b) Observation procedures.

(i) Whenever observation of the measuring or monitoring of employee exposure to DBCP requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the observer with personal protective clothing or equipment required to be worn by employees working in the area, assure the use of such clothing and equipment, and require the observer to comply with all other applicable safety and health procedures.

(ii) Without interfering with the monitoring or measurement, observers shall be entitled to:

(A) Receive an explanation of the measurement procedures;

(B) Observe all steps related to the measurement of airborne concentrations of DBCP performed at the place of exposure; and

(C) Record the results obtained.

(19) Appendices. The information contained in the appendices is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07342, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 96-09-030, § 296-62-07342, filed 4/10/96, effective 6/1/96; 88-11-021 (Order 88-04), § 296-62-07342, filed 5/11/88.]

WAC 296-62-07343 Appendix A—Substance safety data sheet for DBCP. (1) Substance identification.

(a) Synonyms and trades names: DBCP; Dibromochloropropane; Fumazone (Dow Chemical Company TM); Nemaflume; Nemagon (Shell Chemical Co. TM); Nemaset; BBC 12; and OS 1879.

(b) Permissible exposure:

(i) Airborne. 1 part DBCP vapor per billion parts of air (1 ppb); time-weighted average (TWA) for an eight-hour workday.

(ii) Dermal. Eye contact and skin contact with DBCP are prohibited.

(c) Appearance and odor: Technical grade DBCP is a dense yellow or amber liquid with a pungent odor. It may also appear in granular form, or blended in varying concentrations with other liquids.

(d) Uses: DBCP is used to control nematodes, very small worm-like plant parasites, on crops including cotton, soybeans, fruits, nuts, vegetables and ornamentals.

(2) Health hazard data.

(a) Routes of entry: Employees may be exposed:

(i) Through inhalation (breathing);

(ii) Through ingestion (swallowing);

(iii) Skin contact; and

(iv) Eye contact.

(b) Effects of exposure:

(i) Acute exposure. DBCP may cause drowsiness, irritation of the eyes, nose, throat and skin, nausea and vomiting. In addition, overexposure may cause damage to the lungs, liver or kidneys.

(ii) Chronic exposure. Prolonged or repeated exposure to DBCP has been shown to cause sterility in humans. It also has been shown to produce cancer and sterility in laboratory animals and has been determined to constitute an increased risk of cancer in people.

(iii) Reporting signs and symptoms. If you develop any of the above signs or symptoms that you think are caused by exposure to DBCP, you should inform your employer.

(3) Emergency first-aid procedures.

(a) Eye exposure. If DBCP liquid or dust containing DBCP gets into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. Get medical attention immediately. Contact lenses should not be worn when working with DBCP.

(b) Skin exposure. If DBCP liquids or dusts containing DBCP get on your skin, immediately wash using soap or mild detergent and water. If DBCP liquids or dusts containing

DBCP penetrate through your clothing, remove the clothing immediately and wash. If irritation is present after washing get medical attention.

(c) Breathing. If you or any person breathe in large amounts of DBCP, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Do not use mouth-to-mouth. Keep the affected person warm and at rest. Get medical attention as soon as possible.

(d) Swallowing. When DBCP has been swallowed and the person is conscious, give the person large amounts of water immediately. After the water has been swallowed, try to get the person to vomit by having him touch the back of his throat with his finger. Do not make an unconscious person vomit. Get medical attention immediately.

(e) Rescue. Notify someone. Put into effect the established emergency rescue procedures. Know the locations of the emergency rescue equipment before the need arises.

(4) Respirators and protective clothing.

(a) Respirators. You may be required to wear a respirator in emergencies and while your employer is in the process of reducing DBCP exposures through engineering controls. If respirators are worn, they must have a label issued by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 42 CFR part 84 stating that the respirators have been certified for use with organic vapors. For effective protection, a respirator must fit your face and head snugly. The respirator should not be loosened or removed in work situations where its use is required. Respirators must not be loosened or removed in work situations where their use is required.

(b) Protective clothing. When working with DBCP you must wear for your protection impermeable work clothing provided by your employer. (Standard rubber and neoprene protective clothing do not offer adequate protection). DBCP must never be allowed to remain on the skin. Clothing and shoes must not be allowed to become contaminated with DBCP, and if they do, they must be promptly removed and not worn again until completely free of DBCP. Turn in impermeable clothing that has developed leaks for repair or replacement.

(c) Eye protection. You must wear splashproof safety goggles where there is any possibility of DBCP liquid or dust contacting your eyes.

(5) Precautions for safe use, handling, and storage.

(a) DBCP must be stored in tightly closed containers in a cool, well-ventilated area.

(b) If your work clothing may have become contaminated with DBCP, or liquids or dusts containing DBCP, you must change into uncontaminated clothing before leaving the work premises.

(c) You must promptly remove any protective clothing that becomes contaminated with DBCP. This clothing must not be reworn until the DBCP is removed from the clothing.

(d) If your skin becomes contaminated with DBCP, you must immediately and thoroughly wash or shower with soap or mild detergent and water to remove any DBCP from your skin.

(e) You must not keep food, beverages, cosmetics, or smoking materials, nor eat or smoke, in regulated areas.

(f) If you work in a regulated area, you must wash your hands thoroughly with soap or mild detergent and water, before eating, smoking or using toilet facilities.

(g) If you work in a regulated area, you must remove any protective equipment or clothing before leaving the regulated area.

(h) Ask your supervisor where DBCP is used in your work area and for any additional safety and health rules.

(6) Access to information.

(a) Each year, your employer is required to inform you of the information contained in this substance safety data sheet for DBCP. In addition, your employer must instruct you in the safe use of DBCP, emergency procedures, and the correct use of protective equipment.

(b) Your employer is required to determine whether you are being exposed to DBCP. You or your representative have the right to observe employee exposure measurements and to record the result obtained. Your employer is required to inform you of your exposure. If your employer determines that you are being overexposed, they are required to inform you of the actions which are being taken to reduce your exposure.

(c) Your employer is required to keep records of your exposure and medical examinations. Your employer is required to keep exposure and medical data for at least forty years or the duration of your employment plus twenty years, whichever is longer.

(d) Your employer is required to release exposure and medical records to you, your physician, or other individual designated by you upon your written request.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-10-071, § 296-62-07343, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW, 94-15-096 (Order 94-07), § 296-62-07343, filed 7/20/94, effective 9/20/94; 88-11-021 (Order 88-04), § 296-62-07343, filed 5/11/88.]

WAC 296-62-07344 Appendix B—Substance technical guidelines for DBCP. (1) Physical and chemical data.

(a) Substance identification.

(i) Synonyms: 1,2-dibromo-3-chloropropane; DBCP, Fumazone; Nemaflume; Nemagon; Nemaset; BBC 12; OS 1879. DBCP is also included in agricultural pesticides and fumigants which include the phrase "Nema____, in their name.

(ii) Formula: C₃H₅Br₂Cl.

(iii) Molecular weight: 236.

(b) Physical data:

(i) Boiling point (760 mm HG): 195C (383F)

(ii) Specific gravity (water = 1): 2.093.

(iii) Vapor density (air = 1 at boiling point of DBCP):

Data not available.

(iv) Melting point: 6C (43F).

(v) Vapor pressure at 20C (68F): 0.8 mm HG

(vi) Solubility in water: 1000 ppm.

(vii) Evaporation rate (Butyl Acetate = 1): Very much less than 1.

(c) Appearance and odor: Dense yellow or amber liquid with a pungent odor at high concentrations. Any detectable odor of DBCP indicates overexposure.

(2) Fire explosion and reactivity hazard data.

(a) Fire.

(i) Flash point: 170F (77C)

(ii) Autoignition temperature: Data not available.

(iii) Flammable limits in air, percent by volume: Data not available.

(iv) Extinguishing media: Carbon dioxide, dry chemical.

(v) Special fire-fighting procedures: Do not use a solid stream of water since a stream will scatter and spread the fire. Use water spray to cool containers exposed to a fire.

(vi) Unusual fire and explosion hazards: None known.

(vii) For purposes of complying with the requirements of WAC 296-24-330, liquid DBCP is classified as a Class III A combustible liquid.

(viii) For the purpose of complying with chapter 296-24 WAC Part L, the classification of hazardous locations as described in article 500 of the National Electrical Code for DBCP shall be Class I, Group D.

(ix) For the purpose of compliance with WAC 296-24-592, DBCP is classified as a Class B fire hazard.

(x) For the purpose of compliance with WAC 296-24-230, locations classified as hazardous locations due to the presence of DBCP shall be Class I, Group D.

(xi) Sources of ignition are prohibited where DBCP presents a fire or explosion hazard.

(b) Reactivity.

(i) Conditions contributing to instability: None known.

(ii) Incompatibilities: Reacts with chemically active metals, such as aluminum, magnesium and tin alloys.

(iii) Hazardous decomposition products: Toxic gases and vapors (such as HBr, HCl and carbon monoxide) may be released in a fire involving DBCP.

(iv) Special precautions: DBCP will attack some rubber materials and coatings.

(3) Spill, leak and disposal procedures.

(a) If DBCP is spilled or leaked, the following steps should be taken:

(i) The area should be evacuated at once and re-entered only after thorough ventilation.

(ii) Ventilate area of spill or leak.

(iii) If in liquid form, collect for reclamation or absorb in paper, vermiculite, dry sand, earth or similar material.

(iv) If in solid form, collect spilled material in the most convenient and safe manner for reclamation or for disposal.

(b) Persons not wearing protective equipment must be restricted from areas of spills or leaks until cleanup has been completed.

(c) Waste disposal methods:

(i) For small quantities of liquid DBCP, absorb on paper towels, remove to a safe place (such as a fume hood) and burn the paper. Large quantities can be reclaimed or collected and atomized in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device. If liquid DBCP is absorbed in vermiculite, dry sand, earth or similar material and placed in sealed containers it may be disposed of in a state-approved sanitary landfill.

(ii) If in solid form, for small quantities, place on paper towels, remove to a safe place (such as a fume hood) and burn. Large quantities may be reclaimed. However, if this is not practical, dissolve in a flammable solvent (such as alco-

hol) and atomize in a suitable combustion chamber equipped with an appropriate effluent gas cleaning device. DBCP in solid form may also be disposed in a state-approved sanitary landfill.

(4) Monitoring and measurement procedures.

(a) Exposure above the permissible exposure limit.

(i) Eight hour exposure evaluation: Measurements taken for the purpose of determining employee exposure under this section are best taken so that the average eight-hour exposure may be determined from a single eight-hour sample or two four-hour samples. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

(ii) Monitoring techniques: The sampling and analysis under this section may be performed by collecting the DBCP vapor on petroleum based charcoal absorption tubes with subsequent chemical analyses. The method of measurement chosen should determine the concentration of airborne DBCP at the permissible exposure limit to an accuracy of plus or minus twenty-five percent. If charcoal tubes are used, a total volume of ten liters should be collected at a flow rate of 50 cc per minute for each tube. Analyze the resultant samples as you would samples of halogenated solvent.

(b) Since many of the duties relating to employee protection are dependent on the results of monitoring and measuring procedures, employers should assure that the evaluation of employee exposures is performed by a competent industrial hygienist or other technically qualified person.

(5) Protective clothing. Employees should be required to wear appropriate protective clothing to prevent any possibility of skin contact with DBCP. Because DBCP is absorbed through the skin, it is important to prevent skin contact with both liquid and solid forms of DBCP. Protective clothing should include impermeable coveralls or similar fullbody work clothing, gloves, headcoverings, and workshoes or shoe coverings. Standard rubber and neoprene gloves do not offer adequate protection and should not be relied upon to keep DBCP off the skin. DBCP should never be allowed to remain on the skin. Clothing and shoes should not be allowed to become contaminated with the material; and if they do, they should be promptly removed and not worn again until completely free of the material. Any protective clothing which has developed leaks or is otherwise found to be defective should be repaired or replaced. Employees should also be required to wear splashproof safety goggles where there is any possibility of DBCP contacting the eyes.

(6) Housekeeping and hygiene facilities.

(a) The workplace must be kept clean, orderly and in a sanitary condition.

(b) Dry sweeping and the use of compressed air is unsafe for the cleaning of floors and other surfaces where DBCP dust or liquids are found. To minimize the contamination of air with dust, vacuuming with either portable or permanent systems must be used. If a portable unit is selected, the exhaust must be attached to the general workplace exhaust ventilation system, or collected within the vacuum unit equipped with high efficiency filters or other appropriate means of contamination removal and not used for other purposes. Units used to collect DBCP must be labeled.

(c) Adequate washing facilities with hot and cold water must be provided, and maintained in a sanitary condition. Suitable cleansing agents should also be provided to assure the effective removal of DBCP from the skin.

(d) Change or dressing rooms with individual clothes storage facilities must be provided to prevent the contamination of street clothes with DBCP. Because of the hazardous nature of DBCP, contaminated protective clothing must be stored in closed containers for cleaning or disposal.

(7) Miscellaneous precautions.

(a) Store DBCP in tightly closed containers in a cool, well ventilated area.

(b) Use of supplied-air suits or other impervious clothing (such as acid suits) may be necessary to prevent skin contact with DBCP. Supplied-air suits should be selected, used, and maintained under the supervision of persons knowledgeable in the limitations and potential life-endangering characteristics of supplied-air suits.

(c) The use of air-conditioned suits may be necessary in warmer climates.

(d) Advise employees of all areas and operations where exposure to DBCP could occur.

(8) Common operations. Common operations in which exposure to DBCP is likely to occur are: During its production; and during its formulation into pesticides and fumigants.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-62-07344, filed 11/22/91, effective 12/24/91; 88-11-021 (Order 88-04), § 296-62-07344, filed 5/11/88.]

WAC 296-62-07346 Appendix C—Medical surveillance guidelines for DBCP. (1) Route of entry.

(a) Inhalation;

(b) Skin absorption.

(2) Toxicology. Recent data collected on workers involved in the manufacture and formulation of DBCP has shown that DBCP can cause sterility at very low levels of exposure. This finding is supported by studies showing that DBCP causes sterility in animals. Chronic exposure to DBCP resulted in pronounced necrotic action on the parenchymatous organs (i.e., liver, kidney, spleen) and on the testicles of rats at concentrations as low as 5 ppm. Rats that were chronically exposed to DBCP also showed changes in the composition of the blood, showing low RBC, hemoglobin, and WBC, and high reticulocyte levels as well as functional hepatic disturbance, manifesting itself in a long prothrombin time. Reznik et al., noted a single dose of 100 mg produced profound depression of the nervous system of rats. Their condition gradually improved. Acute exposure also resulted in the destruction of the sex gland activity of male rats as well as causing changes in the estrous cycle in female rats. Animal studies have also associated DBCP with an increased incidence of carcinoma. Olson, et al., orally administered DBCP to rats and mice five times per week at experimentally predetermined maximally tolerated doses and at half those doses. As early as ten weeks after initiation of treatment, DBCP induced a high incidence of squamous cell carcinomas of the stomach with metastases in both species. DBCP also induced mammary adenocarcinomas in the female rats at both dose levels.

(3) Signs and symptoms.

(a) Inhalation: Nausea, eye irritation, conjunctivitis, respiratory irritation, pulmonary congestion or edema, CNS depression with apathy, sluggishness, and ataxia.

(b) Dermal: Erythema or inflammation and dermatitis on repeated exposure.

(4) Special tests.

(a) Semen analysis: The following information excerpted from the document "Evaluation of Testicular Function," submitted by the Corporate Medical Department of the Shell Oil Company (exhibit 39-3), may be useful to physicians conducting the medical surveillance program. In performing semen analyses certain minimal but specific criteria should be met:

(i) It is recommended that a minimum of three valid semen analyses be obtained in order to make a determination of an individual's average sperm count.

(ii) A period of sexual abstinence is necessary prior to the collection of each masturbatory sample. It is recommended that intercourse or masturbation be performed 48 hours before the actual specimen collection. A period of 48 hours of abstinence would follow; then the masturbatory sample would be collected.

(iii) Each semen specimen should be collected in a clean, widemouthed, glass jar (not necessarily pre-sterilized) in a manner designated by the examining physician. Any part of the seminal fluid exam should be initiated *only after liquifaction* is complete, i.e., 30 to 45 minutes after collection.

(iv) Semen volume should be measured to the nearest 1/10 of a cubic centimeter.

(v) Sperm density should be determined using routine techniques involving the use of a white cell pipette and a hemocytometer chamber. The immobilizing fluid most effective and most easily obtained for this process is distilled water.

(vi) Thin, dry smears of the semen should be made for a morphologic classification of the sperm forms and should be stained with either hematoxylin or the more difficult, yet more precise, Papanicolaou technique. Also of importance to record is obvious sperm agglutination, pyospermia, delayed liquifaction (greater than 30 minutes), and hyperviscosity. In addition, pH, using nitrazine paper, should be determined.

(vii) A total morphology evaluation should include percentages of the following:

(A) Normal (oval) forms,

(B) Tapered forms,

(C) Amorphous forms (include large and small sperm shapes),

(D) Duplicated (either heads or tails) forms, and

(E) Immature forms.

(viii) Each sample should be evaluated for sperm *viability* (percent viable sperm moving at the time of examination) as well as sperm *motility* (subjective characterization of "purposeful forward sperm progression" of the majority of those viable sperm analyzed) within two hours after collection, ideally by the same or equally qualified examiner.

(b) Serum determinations: The following serum determinations should be performed by radiomuno-assay techniques using National Institutes of Health (NIH) specific antigen or antigen preparations of equivalent sensitivity:

(i) Serum follicle stimulating hormone (FSH),

(ii) Serum luteinizing hormone (LH), and

(iii) Serum total estrogen (females only).

(5) Treatment. Remove from exposure immediately, give oxygen or artificial resuscitation if indicated. Contaminated clothing and shoes should be removed immediately. Flush eyes and wash contaminated skin. If swallowed and the person is conscious, induce vomiting. Recovery from mild exposures is usually rapid and complete.

(6) Surveillance and preventive considerations.

(a) Other considerations. DBCP can cause both acute and chronic effects. It is important that the physician become familiar with the operating conditions in which exposure to DBCP occurs. Those with respiratory disorders may not tolerate the wearing of negative pressure respirators.

(b) Surveillance and screening. Medical histories and laboratory examinations are required for each employee subject to exposure to DBCP. The employer should screen employees for history of certain medical conditions (listed below) which might place the employee at increased risk from exposure:

(i) Liver disease. The primary site of biotransformation and detoxification of DBCP is the liver. Liver dysfunctions likely to inhibit the conjugation reactions will tend to promote the toxic actions of DBCP. These precautions should be considered before exposing persons with impaired liver function to DBCP.

(ii) Renal disease. Because DBCP has been associated with injury to the kidney it is important that special consideration be given to those with possible impairment of renal function.

(iii) Skin disease. DBCP can penetrate the skin and can cause erythema on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of DBCP.

(iv) Blood dyscrasias. DBCP has been shown to decrease the content of erythrocytes, hemoglobin, and leukocytes in the blood, as well as increase the prothrombin time. Persons with existing blood disorders may be more susceptible to the effects of DBCP.

(v) Reproductive disorders. Animal studies have associated DBCP with various effects on the reproductive organs. Among these effects are atrophy of the testicles and changes in the estrous cycle. Persons with pre-existing reproductive disorders may be at increased risk to these effects of DBCP.

(7) References.

(a) Reznik, Ya. B. and Sprinchan, G. K.: Experimental Data on the Gonadotoxic effect of Nemagon, *Gig. Sanit.*, (6), 1975, pp. 101-102, (translated from Russian).

(b) Faydysh, E. V., Rakhmatullaev, N. N. and Varshavskii, V. A.: The Cytotoxic Action of Nemagon in a Subacute Experiment, *Med. Zh. Uzbekistana*, (No. 1), 1970, pp. 64-65, (translated from Russian).

(c) Rakhmatullaev, N. N.: Hygienic Characteristics of the Nematocide Nemagon in Relation to Water Pollution Control, *Hyg. Sanit.*, 36(3), 1971, pp. 344-348, (translated from Russian).

(d) Olson, W. A. *et al.*: Induction of Stomach Cancer in Rats and Mice by Halogenated Aliphatic Fumigants, *Journal of the National Cancer Institute*, (51), 1973, pp. 1993-1995.

(e) Torkelson, T. R. *et al.*: Toxicologic Investigations of 1,2-Dibromo-3-chloropropane, *Toxicology and Applied Pharmacology*, 3, 1961 pp. 545-559.

[Statutory Authority: Chapter 49.17 RCW. 88-11-021 (Order 88-04), § 296-62-07346, filed 5/11/88.]

WAC 296-62-07347 Inorganic arsenic. (1) Scope and application. This section applies to all occupational exposures to inorganic arsenic except that this section does not apply to employee exposures in agriculture or resulting from pesticide application, the treatment of wood with preservatives or the utilization of arsenically preserved wood.

(2) Definitions.

(a) "Action level" - a concentration of inorganic arsenic of 5 micrograms per cubic meter of air ($5 \mu\text{g}/\text{m}^3$) averaged over any eight-hour period.

(b) "Authorized person" - any person specifically authorized by the employer whose duties require the person to enter a regulated area, or any person entering such an area as a designated representative of employees for the purpose of exercising the right to observe monitoring and measuring procedures under subsection (5) of this section.

(c) "Director" - the director of the department of labor and industries, or his/her designated representative.

(d) "Inorganic arsenic" - copper aceto-arsenite and all inorganic compounds containing arsenic except arsine, measured as arsenic (As).

(3) Permissible exposure limit. The employer shall assure that no employee is exposed to inorganic arsenic at concentrations greater than 10 micrograms per cubic meter of air ($10 \mu\text{g}/\text{m}^3$), averaged over any eight-hour period.

(4) Notification of use.

(a) Within sixty days after the introduction of inorganic arsenic into the workplace, every employer who is required to establish a regulated area in his/her workplaces shall report in writing to the department of labor and industries for each such workplace:

(i) The address of each such workplace;

(ii) The approximate number of employees who will be working in regulated areas; and

(iii) A brief summary of the operations creating the exposure and the actions which the employer intends to take to reduce exposures.

(b) Whenever there has been a significant change in the information required by subsection (4)(a) of this section, the employer shall report the changes in writing within sixty days to the department of labor and industries.

(5) Exposure monitoring.

(a) General.

(i) Determinations of airborne exposure levels shall be made from air samples that are representative of each employee's exposure to inorganic arsenic over an eight-hour period.

(ii) For the purposes of this section, employee exposure is that exposure which would occur if the employee were not using a respirator.

(iii) The employer shall collect full shift (for at least seven continuous hours) personal samples including at least one sample for each shift for each job classification in each work area.

(b) Initial monitoring. Each employer who has a workplace or work operation covered by this standard shall monitor each such workplace and work operation to accurately determine the airborne concentration of inorganic arsenic to which employees may be exposed.

(c) Frequency.

(i) If the initial monitoring reveals employee exposure to be below the action level the measurements need not be repeated except as otherwise provided in subsection (5)(d) of this section.

(ii) If the initial monitoring, required by this section, or subsequent monitoring reveals employee exposure to be above the permissible exposure limit, the employer shall repeat monitoring at least quarterly.

(iii) If the initial monitoring, required by this section, or subsequent monitoring reveals employee exposure to be above the action level and below the permissible exposure limit the employee shall repeat monitoring at least every six months.

(iv) The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least seven days apart, are below the action level at which time the employer may discontinue monitoring for that employee until such time as any of the events in subsection (5)(d) of this section occur.

(d) Additional monitoring. Whenever there has been a production, process, control or personal change which may result in new or additional exposure to inorganic arsenic, or whenever the employer has any other reason to suspect a change which may result in new or additional exposures to inorganic arsenic, additional monitoring which complies with subsection (5) of this section shall be conducted.

(e) Employee notification.

(i) Within five working days after the receipt of monitoring results, the employer shall notify each employee in writing of the results which represent that employee's exposures.

(ii) Whenever the results indicate that the representative employee exposure exceeds the permissible exposure limit, the employer shall include in the written notice a statement that the permissible exposure limit was exceeded and a description of the corrective action taken to reduce exposure to or below the permissible exposure limit.

(f) Accuracy of measurement.

(i) The employer shall use a method of monitoring and measurement which has an accuracy (with a confidence level of 95 percent) of not less than plus or minus 25 percent for concentrations of inorganic arsenic greater than or equal to $10 \mu\text{g}/\text{m}^3$.

(ii) The employer shall use a method of monitoring and measurement which has an accuracy (with confidence level of 95 percent) of not less than plus or minus 35 percent for concentrations of inorganic arsenic greater than $5 \mu\text{g}/\text{m}^3$ but less than $10 \mu\text{g}/\text{m}^3$.

(6) Regulated area.

(a) Establishment. The employer shall establish regulated areas where worker exposures to inorganic arsenic, without regard to the use of respirators, are in excess of the permissible limit.

(b) Demarcation. Regulated areas shall be demarcated and segregated from the rest of the workplace in any manner

that minimizes the number of persons who will be exposed to inorganic arsenic.

(c) Access. Access to regulated areas shall be limited to authorized persons or to persons otherwise authorized by the Act or regulations issued pursuant thereto to enter such areas.

(d) Provision of respirators. All persons entering a regulated area shall be supplied with a respirator, selected in accordance with subsection (8)(c) of this section.

(e) Prohibited activities. The employer shall assure that in regulated areas, food or beverages are not consumed, smoking products, chewing tobacco and gum are not used and cosmetics are not applied, except that these activities may be conducted in the lunchrooms, change rooms and showers required under subsection (12) of this section. Drinking water may be consumed in the regulated area.

(7) Methods of compliance.

(a) Controls.

(i) The employer shall institute engineering and work practice controls to reduce exposures to or below the permissible exposure limit, except to the extent that the employer can establish that such controls are not feasible.

(ii) Where engineering and work practice controls are not sufficient to reduce exposures to or below the permissible exposure limit, they shall nonetheless be used to reduce exposures to the lowest levels achievable by these controls and shall be supplemented by the use of respirators in accordance with subsection (8) of this section and other necessary personal protective equipment. Employee rotation is not required as a control strategy before respiratory protection is instituted.

(b) Compliance program.

(i) The employer shall establish and implement a written program to reduce exposures to or below the permissible exposure limit by means of engineering and work practice controls.

(ii) Written plans for these compliance programs shall include at least the following:

(A) A description of each operation in which inorganic arsenic is emitted; e.g., machinery used, material processed, controls in place, crew size, operating procedures and maintenance practices;

(B) Engineering plans and studies used to determine methods selected for controlling exposure to inorganic arsenic;

(C) A report of the technology considered in meeting the permissible exposure limit;

(D) Monitoring data;

(E) A detailed schedule for implementation of the engineering controls and work practices that cannot be implemented immediately and for the adaption and implementation of any additional engineering and work practices necessary to meet the permissible exposure limit;

(F) Whenever the employer will not achieve the permissible exposure limit with engineering controls and work practices, the employer shall include in the compliance plan an analysis of the effectiveness of the various controls, shall install engineering controls and institute work practices on the quickest schedule feasible, and shall include in the compliance plan and implement a program to minimize the discomfort and maximize the effectiveness of respirator use; and

(G) Other relevant information.

(iii) Written plans for such a program shall be submitted upon request to the director, and shall be available at the worksite for examination and copying by the director, any affected employee or authorized employee representatives.

(iv) The plans required by this subsection shall be revised and updated at least every six months to reflect the current status of the program.

(8) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(i) Period necessary to install or implement feasible engineering or work-practice controls;

(ii) Work operations, such as maintenance and repair activities, in which the employer establishes that engineering and work-practice controls are not feasible;

(iii) Work operations for which engineering work-practice controls are not yet sufficient to reduce employee exposures to or below the permissible exposure limit;

(iv) Emergencies.

(b) Respirator program.

(i) The employer must establish, implement, and maintain a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(ii) If an employee exhibits breathing difficulty during fit testing or respirator use, they must be examined by a physician trained in pulmonary medicine to determine whether they can use a respirator while performing the required duty.

(c) Respirator selection.

(i) The employer must use Table I of this section to select the appropriate respirator or combination of respirators for inorganic arsenic compounds without significant vapor pressure, and Table II of this section to select the appropriate respirator or combination of respirators for inorganic arsenic compounds that have significant vapor pressure.

(ii) Where employee exposures exceed the permissible exposure limit for inorganic arsenic and also exceed the relevant limit for other gases (for example, sulfur dioxide), any air-purifying respirator provided to the employee as specified by this section must have a combination high-efficiency filter with an appropriate gas sorbent. (See footnote in Table I)

(iii) Employees required to use respirators may choose, and the employer must provide, a powered air-purifying respirator if it will provide proper protection. In addition, the employer must provide a combination dust and acid-gas respirator to employees who are exposed to gases over the relevant exposure limits.

TABLE I

RESPIRATORY PROTECTION FOR INORGANIC ARSENIC PARTICULATE EXCEPT FOR THOSE WITH SIGNIFICANT VAPOR PRESSURE

Concentration of Inorganic Arsenic (as As) or Condition of Use	Required Respirator
(i) Unknown or greater or lesser than 20,000 $\mu\text{g}/\text{m}^3$ (20 mg/m^3) firefighting.	(A) Any full facepiece self-contained or breathing apparatus operated in positive pressure mode.
(ii) Not greater than 20,000 $\mu\text{g}/\text{m}^3$ (20 mg/m^3)	(A) Supplied air respirator with full facepiece, hood, or helmet or suit and operated in positive pressure mode.
(iii) Not greater than 10,000 $\mu\text{g}/\text{m}^3$ (10 mg/m^3)	(A) Powered air-purifying respirators in all inlet face coverings with high-efficiency filters. ¹ (B) Half-mask supplied air respirators operated in positive pressure mode.
(iv) Not greater than 500 $\mu\text{g}/\text{m}^3$	(A) Full facepiece air-purifying respirator equipped with high-efficiency filter. ¹ (B) Any full facepiece supplied air respirator. (C) Any full facepiece self-contained breathing apparatus.
(v) Not greater than 100 $\mu\text{g}/\text{m}^3$	(A) Half-mask air-purifying respirator equipped with high-efficiency filter. ¹ (B) Any half-mask supplied air respirator.

¹High-efficiency filter-99.97 pct efficiency against 0.3 micrometer monodisperse diethyl-hexyl phthalate (DOP) particles.

TABLE II

RESPIRATORY PROTECTION FOR INORGANIC ARSENICALS (SUCH AS ARSENIC TRICHLORIDE² AND ARSENIC PHOSPHIDE) WITH SIGNIFICANT VAPOR PRESSURE

Concentration of Inorganic Arsenic (as As) or Condition of Use	Required Respirator
(i) Unknown or greater or lesser than 20,000 $\mu\text{g}/\text{m}^3$ (20 mg/m^3) or firefighting.	(A) Any full facepiece contained breathing apparatus operated in positive pressure mode.

(2001 Ed.)

Concentration of Inorganic Arsenic (as As) or Condition of Use

Concentration of Inorganic Arsenic (as As) or Condition of Use	Required Respirator
(ii) Not greater than 20,000 $\mu\text{g}/\text{m}^3$ (20 mg/m^3)	(A) Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.
(iii) Not greater than 10,000 $\mu\text{g}/\text{m}^3$ (10 mg/m^3)	(A) Half-mask ² supplied air respirator operated in positive pressure mode.
(iv) Not greater than 500 $\mu\text{g}/\text{m}^3$	(A) Front or back mounted gas mask equipped with high-efficiency filter ¹ and acid gas canister. (B) Any full facepiece supplied air respirator. (C) Any full facepiece self-contained breathing apparatus.
(v) Not greater than 100 $\mu\text{g}/\text{m}^3$	(A) Half-mask ² air-purifying respirator equipped with high-efficiency filter ¹ and acid gas cartridge. (B) Any half-mask supplied air respirator.

¹High efficiency filter-99.97 pct efficiency against 0.3 micrometer monodisperse diethyl-hexyl phthalate (DOP) particles.

²Half-mask respirators shall not be used for protection against arsenic trichloride, as it is rapidly absorbed through the skin.

(9) Reserved.

(10) Protective work clothing and equipment.

(a) Provision and use. Where the possibility of skin or eye irritation from inorganic arsenic exists, and for all workers working in regulated areas, the employer shall provide at no cost to the employee and assure that employees use appropriate and clean protective work clothing and equipment such as, but not limited to:

(i) Coveralls or similar full-body work clothing;

(ii) Gloves, and shoes or coverlets;

(iii) Face shields or vented goggles when necessary to prevent eye irritation, which comply with the requirements of WAC 296-24-07801 (1) - (6).

(iv) Impervious clothing for employees subject to exposure to arsenic trichloride.

(b) Cleaning and replacement.

(i) The employer shall provide the protective clothing required in subsection (10)(a) of this section in a freshly laundered and dry condition at least weekly, and daily if the employee works in areas where exposures are over 100 $\mu\text{g}/\text{m}^3$ of inorganic arsenic or in areas where more frequent washing is needed to prevent skin irritation.

(ii) The employer shall clean, launder, or dispose of protective clothing required by subsection (10)(a) of this section.

(iii) The employer shall repair or replace the protective clothing and equipment as needed to maintain their effectiveness.

(iv) The employer shall assure that all protective clothing is removed at the completion of a work shift only in change rooms prescribed in subsection (13)(a) of this section.

(v) The employer shall assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change-room which prevents dispersion of inorganic arsenic outside the container.

(vi) The employer shall inform in writing any person who cleans or launders clothing required by this section, of the potentially harmful affects including the carcinogenic effects of exposure to inorganic arsenic.

(vii) The employer shall assure that the containers of contaminated protective clothing and equipment in the workplace or which are to be removed from the workplace are labeled as follows:

Caution: Clothing contaminated with inorganic arsenic; do not remove dust by blowing or shaking. Dispose of inorganic arsenic contaminated wash water in accordance with applicable local, state, or federal regulations.

(viii) The employer shall prohibit the removal of inorganic arsenic from protective clothing or equipment by blowing or shaking.

(11) Housekeeping.

(a) Surfaces. All surfaces shall be maintained as free as practicable of accumulations of inorganic arsenic.

(b) Cleaning floors. Floors and other accessible surfaces contaminated with inorganic arsenic may not be cleaned by the use of compressed air, and shoveling and brushing may be used only where vacuuming or other relevant methods have been tried and found not to be effective.

(c) Vacuuming. Where vacuuming methods are selected, the vacuums shall be used and emptied in a manner to minimize the reentry of inorganic arsenic into the workplace.

(d) Housekeeping plan. A written housekeeping and maintenance plan shall be kept which shall list appropriate frequencies for carrying out housekeeping operations, and for cleaning and maintaining dust collection equipment. The plan shall be available for inspection by the director.

(e) Maintenance of equipment. Periodic cleaning of dust collection and ventilation equipment and checks of their effectiveness shall be carried out to maintain the effectiveness of the system and a notation kept of the last check of effectiveness and cleaning or maintenance.

(12) **Reserved.**

(13) Hygiene facilities and practices.

(a) Change rooms. The employer shall provide for employees working in regulated areas or subject to the possibility of skin or eye irritation from inorganic arsenic, clean change rooms equipped with storage facilities for street clothes and separate storage facilities for protective clothing and equipment in accordance with WAC 296-24-12011.

(b) Showers.

(i) The employer shall assure that employees working in regulated areas or subject to the possibility of skin or eye irri-

tation from inorganic arsenic shower at the end of the work shift.

(ii) The employer shall provide shower facilities in accordance with WAC 296-24-12009(3).

(c) Lunchrooms.

(i) The employer shall provide for employees working in regulated areas, lunchroom facilities which have a temperature controlled, positive pressure, filtered air supply, and which are readily accessible to employees working in regulated areas.

(ii) The employer shall assure that employees working in the regulated area or subject to the possibility of skin or eye irritation from exposure to inorganic arsenic wash their hands and face prior to eating.

(d) Lavatories. The employer shall provide lavatory facilities which comply with WAC 296-24-12009 (1) and (2).

(e) Vacuuming clothes. The employer shall provide facilities for employees working in areas where exposure, without regard to the use of respirators, exceeds 100 µg/m³ to vacuum their protective clothing and clean or change shoes worn in such areas before entering change rooms, lunchrooms or shower rooms required by subsection (10) of this section and shall assure that such employees use such facilities.

(f) Avoidance of skin irritation. The employer shall assure that no employee is exposed to skin or eye contact with arsenic trichloride, or to skin or eye contact with liquid or particulate inorganic arsenic which is likely to cause skin or eye irritation.

(14) Medical surveillance.

(a) General.

(i) Employees covered. The employer shall institute a medical surveillance program for the following employees:

(A) All employees who are or will be exposed above the action level, without regard to the use of respirators, at least thirty days per year; and

(B) All employees who have been exposed above the action level, without regard to respirator use, for thirty days or more per year for a total of ten years or more of combined employment with the employer or predecessor employers prior to or after the effective date of this standard. The determination of exposures prior to the effective date of this standard shall be based upon prior exposure records, comparison with the first measurements taken after the effective date of this standard, or comparison with records of exposures in areas with similar processes, extent of engineering controls utilized and materials used by that employer.

(ii) Examination by physician. The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician, and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

(b) Initial examinations. For employees initially covered by the medical provisions of this section, or thereafter at the time of initial assignment to an area where the employee is likely to be exposed over the action level at least thirty days per year, the employer shall provide each affected employee an opportunity for a medical examination, including at least the following elements:

(i) A work history and a medical history which shall include a smoking history and the presence and degree of respiratory symptoms such as breathlessness, cough, sputum production and wheezing.

(ii) A medical examination which shall include at least the following:

(A) A 14" by 17" posterior-anterior chest x-ray and International Labor Office UICC/Cincinnati (ILO U/C) rating;

(B) A nasal and skin examination; and

(C) Other examinations which the physician believes appropriate because of the employees exposure to inorganic arsenic or because of required respirator use.

(c) Periodic examinations.

(i) The employer shall provide the examinations specified in subsection (14)(b)(i) and (ii)(A), (B) and (C) of this section at least annually for covered employees who are under forty-five years of age with fewer than ten years of exposure over the action level without regard to respirator use.

(ii) The employer shall provide the examinations specified in subsection (14)(b)(i) and (ii)(B) and (C) of this section at least semi-annually, and the x-ray requirements specified in subsection (14)(b)(ii)(A) of this section at least annually, for other covered employees.

(iii) Whenever a covered employee has not taken the examinations specified in subsection (14)(b)(i) and (ii)(B) and (C) of this section within six months preceding the termination of employment, the employer shall provide such examinations to the employee upon termination of employment.

(d) Additional examinations. If the employee for any reason develops signs or symptoms commonly associated with exposure to inorganic arsenic the employer shall provide an appropriate examination and emergency medical treatment.

(e) Information provided to the physician. The employer shall provide the following information to the examining physician:

(i) A copy of this standard and its appendices;

(ii) A description of the affected employee's duties as they relate to the employee's exposure;

(iii) The employee's representative exposure level or anticipated exposure level;

(iv) A description of any personal protective equipment used or to be used; and

(v) Information from previous medical examinations of the affected employee which is not readily available to the examining physician.

(f) Physician's written opinion.

(i) The employer shall obtain a written opinion from the examining physician which shall include:

(A) The results of the medical examination and tests performed;

(B) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from exposure to inorganic arsenic;

(C) Any recommended limitations upon the employee's exposure to inorganic arsenic or upon the use of protective clothing or equipment such as respirators; and

(D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(ii) The employer shall instruct the physician not to reveal in the written opinion specific findings or diagnoses unrelated to occupational exposure.

(iii) The employer shall provide a copy of the written opinion to the affected employee.

(15) Employee information and training.

(a) Training program.

(i) The employer shall institute a training program for all employees who are subject to exposure to inorganic arsenic above the action level without regard to respirator use, or for whom there is the possibility of skin or eye irritation from inorganic arsenic. The employer shall assure that those employees participate in the training program.

(ii) The training program shall be provided for employees covered by this provision, at the time of initial assignment for those subsequently covered by this provision, and shall be repeated at least quarterly for employees who have optional use of respirators and at least annually for other covered employees thereafter, and the employer shall assure that each employee is informed of the following:

(A) The information contained in Appendix A;

(B) The quantity, location, manner of use, storage, sources of exposure, and the specific nature of operations which could result in exposure to inorganic arsenic as well as any necessary protective steps;

(C) The purpose, proper use, and limitation of respirators;

(D) The purpose and a description of medical surveillance program as required by subsection (14) of this section;

(E) The engineering controls and work practices associated with the employee's job assignment; and

(F) A review of this standard.

(b) Access to training materials.

(i) The employer shall make readily available to all affected employees a copy of this standard and its appendices.

(ii) The employer shall provide, upon request, all materials relating to the employee information and training program to the director.

(16) Signs and labels.

(a) General.

(i) The employer may use labels or signs required by other statutes, regulations, or ordinances in addition to, or in combination with, signs and labels required by this subsection.

(ii) The employer shall assure that no statement appears on or near any sign or label required by this subsection which contradicts or detracts from the meaning of the required sign or label.

(b) Signs.

(i) The employer shall post signs demarcating regulated areas bearing the legend:

DANGER
INORGANIC ARSENIC
CANCER HAZARD
AUTHORIZED PERSONNEL ONLY
NO SMOKING OR EATING
RESPIRATOR REQUIRED

(ii) The employer shall assure that signs required by this subsection are illuminated and cleaned as necessary so that the legend is readily visible.

(c) Labels. The employer shall apply precautionary labels to all shipping and storage containers of inorganic arsenic, and to all products containing inorganic arsenic except when the inorganic arsenic in the product is bound in such a manner so as to make unlikely the possibility of air-borne exposure to inorganic arsenic. (Possible examples of products not requiring labels are semiconductors, light emitting diodes and glass.) The label shall bear the following legend:

DANGER
CONTAINS INORGANIC ARSENIC
CANCER HAZARD
HARMFUL IF INHALED OR
SWALLOWED
USE ONLY WITH ADEQUATE
VENTILATION
OR RESPIRATORY PROTECTION

(17) Recordkeeping.

(a) Exposure monitoring.

(i) The employer shall establish and maintain an accurate record of all monitoring required by subsection (5) of this section.

(ii) This record shall include:

(A) The date(s), number, duration location, and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure where applicable;

(B) A description of the sampling and analytical methods used and evidence of their accuracy;

(C) The purpose, proper use, limitations, and other training requirements covering respiratory protection as required in chapter 296-62 WAC, Part E;

(D) Name, Social Security number, and job classification of the employees monitored and of all other employees whose exposure the measurement is intended to represent; and

(E) The environmental variables that could affect the measurement of the employee's exposure.

(iii) The employer shall maintain these monitoring records for at least forty years or for the duration of employment plus twenty years, whichever is longer.

(b) Medical surveillance.

(i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance as required by subsection (14) of this section.

(ii) This record shall include:

(A) The name, Social Security number, and description of duties of the employee;

(B) A copy of the physician's written opinions;

(C) Results of any exposure monitoring done for that employee and the representative exposure levels supplied to the physician; and

(D) Any employee medical complaints related to exposure to inorganic arsenic.

(iii) The employer shall in addition keep, or assure that the examining physician keeps, the following medical records:

(A) A copy of the medical examination results including medical and work history required under subsection (14) of this section;

(B) A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information;

(C) The initial x-ray;

(D) The x-rays for the most recent five years; and

(E) Any x-rays with a demonstrated abnormality and all subsequent x-rays.

(iv) The employer shall maintain or assure that the physician maintains those medical records for at least forty years, or for the duration of employment, plus twenty years, whichever is longer.

(c) Availability.

(i) The employer shall make available upon request all records required to be maintained by subsection (17) of this section to the director for examination and copying.

(ii) Records required by this subsection shall be provided upon request to employees, designated representatives, and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(iii) The employer shall make available upon request an employee's medical records and exposure records representative of that employee's exposure required to be maintained by subsection (17) of this section to the affected employee or former employee or to a physician designated by the affected employee or former employee.

(d) Transfer of records.

(i) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by this section.

(ii) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records required to be maintained by this section for the prescribed period, these records shall be transmitted to the director.

(iii) At the expiration of the retention period for the records required to be maintained by this section, the employer shall notify the director at least three months prior to the disposal of such records and shall transmit those records to the director if he requests them within that period.

(iv) The employer shall also comply with any additional requirements involving transfer of records set forth in WAC 296-62-05215.

(18) Observation of monitoring.

(a) Employee observation. The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to inorganic arsenic conducted pursuant to subsection (5) of this section.

(b) Observation procedures.

(i) Whenever observation of the monitoring of employee exposure to inorganic arsenic requires entry into an area where the use of respirators, protective clothing, or equipment is required, the employer shall provide the observer with and assure the use of such respirators, clothing, and such equipment, and shall require the observer to comply with all other applicable safety and health procedures.

(ii) Without interfering with the monitoring, observers shall be entitled to:

(A) Receive an explanation of the measurement procedures;

(B) Observe all steps related to the monitoring of inorganic arsenic performed at the place of exposure; and

(C) Record the results obtained or receive copies of the results when returned by the laboratory.

(19) Appendices. The information contained in the appendices to this section is not intended by itself, to create any additional obligations not otherwise imposed by this standard nor detract from any existing obligation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-62-07347, filed 8/17/99, effective 12/1/99; 99-10-071, § 296-62-07347, filed 5/4/99, effective 9/1/99; 98-02-030, § 296-62-07347, filed 12/31/97, effective 1/31/98. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07347, filed 7/20/94, effective 9/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-07347, filed 8/27/81; 81-16-015 (Order 81-20), § 296-62-07347, filed 7/27/81; 79-08-115 (Order 79-9), § 296-62-07347, filed 7/31/79; 79-02-037 (Order 79-1), § 296-62-07347, filed 1/23/79.]

WAC 296-62-07354 Appendices—Inorganic arsenic.

The information in Appendices A, B, and C is not intended, by itself, to create any additional obligations not otherwise imposed by WAC 296-62-07347 nor detract from existing obligation.

(1) Appendix A—Inorganic arsenic substance information sheet.

(a) Substance identification.

(i) Substance. Inorganic arsenic.

(ii) Definition. Copper acetoarsenite, arsenic and all inorganic compounds containing arsenic except arsine, measured as arsenic (As).

(iii) Permissible exposure limit. Ten micrograms per cubic meter of air as determined as an average over an 8 hour period. No employee may be exposed to any skin or eye contact with arsenic trichloride or to skin or eye contact likely to cause skin or eye irritation.

(iv) Regulated areas. Only employees authorized by your employer should enter a regulated area.

(b) Health hazard data.

(i) Comments. The health hazard of inorganic arsenic is high.

(ii) Ways in which the chemical affects your body. Exposure to airborne concentrations of inorganic arsenic may cause lung cancer, and can be a skin irritant. Inorganic arsenic may also affect your body if swallowed. One compound in particular, arsenic trichloride, is especially dangerous because it can be absorbed readily through the skin. Because inorganic arsenic is a poison, you should wash your hands thoroughly prior to eating or smoking.

(c) Personal protective equipment and clothing.

(i) Respirators. Respirators will be provided by the employer at no cost to employees for routine use if the employer is in the process of implementing engineering and work practice controls or where engineering and work practice controls are not feasible or insufficient. Respirators must be worn for nonroutine activities or in emergency situations where there is likely to be exposure to levels of inorganic arsenic in excess of the permissible exposure limit. Since how well the respirator fits is very important, the employer is required to conduct fit tests to make sure the respirator seals properly when worn. These tests are simple and rapid and will be explained during training sessions.

(ii) Protective clothing. If work is in a regulated area, the employer is required to provide at no cost to employees, and it must be worn, appropriate, clean, protective clothing and equipment. The purpose of this equipment is to prevent the employee from taking home arsenic-contaminated dust and to protect the body from repeated skin contact with inorganic arsenic likely to cause skin irritation. This clothing shall include such items as coveralls or similar full-body clothing, gloves, shoes or coverlets, and aprons. Protective equipment should include face shields or vented goggles, where eye irritation may occur.

(d) Hygiene facilities and practices.

(i) The employer shall ensure that employees do not eat, drink, smoke, chew gum or tobacco, or apply cosmetics in the regulated area, except that drinking water is permitted. If work is in a regulated area, the employer is required to provide lunchrooms or other areas for these purposes.

(ii) If work is in a regulated area, the employer is required to provide showers, washing facilities, and change rooms. The employer shall ensure that employees wash faces and hands before eating and shower at the end of the work shift. Do not take used protective clothing out of change rooms without the employer's permission. The employer is required to provide for laundering or cleaning of the protective clothing.

(e) Signs and labels. The employer is required to post warning signs and labels for employee protection. Signs must be posted in regulated areas. The signs must warn that a cancer hazard is present, that only authorized employees may enter the area, and that no smoking or eating is allowed, and that respirators must be worn.

(f) Medical examinations. If exposure to arsenic is over the action level (5 µg/m³) (including all persons working in regulated areas) at least 30 days per year, or employees have been exposed to arsenic for more than 10 years over the action level, the employer is required to provide employees with a medical examination. The examination shall be every 6 months for employees over 45 years old or with more than 10 years exposure over the action level and annually for other covered employees. The medical examination must include a medical history; a chest x-ray (annual requirement only); skin examination; and nasal examination. The examining physician will provide a written opinion to the employer containing the results of the medical exams. Employees should also receive a copy of this opinion. The physician must not tell the employer any conditions he detects unrelated to occupational exposure to arsenic but must tell employees those conditions.

(g) Observation of monitoring. The employer is required to monitor employee exposure to arsenic and employees or their representatives are entitled to observe the monitoring procedure. Employees are entitled to receive an explanation of the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, employees must also be provided with and must wear the protective clothing and equipment.

(h) Access to records. Employees or their representatives are entitled to records of employee exposure to inorganic arsenic upon request to the employer. Employee medical examination records can be furnished to employees' physician if employees request the employer to provide them.

(i) Training and notification. Additional information on all of these items plus training as to hazards of exposure to inorganic arsenic and the engineering and work practice controls associated with employees' jobs will also be provided by the employer. If employees are exposed over the permissible exposure limit, the employer must inform employees of that fact and the actions to be taken to reduce employee exposure.

(2) Appendix B—Substance technical guidelines. Arsenic, arsenic trioxide, arsenic trichloride (3 examples)

(a) Physical and chemical properties

(i) Arsenic (metal)

(A) Formula: As

(B) Appearance: Gray metal

(C) Melting point: Sublimes without melting at 613C

(D) Specific gravity: ($H_2O = 1$):5.73.

(E) Solubility in water: Insoluble

(ii) Arsenic trioxide

(A) Formula: As_2O_3 , (As_4O_6).

(B) Appearance: White powder

(C) Melting point: 315C

(D) Specific gravity: ($H_2O = 1$):3.74

(E) Solubility in water: 3.7 grams in 100cc of water at 20C

(iii) Arsenic trichloride (liquid)(Trichloride)

(A) Formula: $AsCl_3$

(B) Appearance: Colorless or pale yellow liquid

(C) Melting point: -8.5C

(D) Boiling point: 130.2C

(E) Specific gravity ($1120 = 1$):2:16 at 20C

(F) Vapor Pressure: 10mm Hg at 23.5C.

(G) Solubility in water: Decomposes in water.

(b) Fire, explosion, and reactivity data.

(i) Fire: Arsenic trioxide and arsenic trichloride are non-flammable.

(ii) Reactivity:

(A) Conditions contributing to instability: Heat.

(B) Incompatibility: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.

(c) Monitoring and measurement procedures.

(i) Samples collected should be full shift (at least 7 hours) samples. Sampling should be done using a personal sampling pump at a flow rate of 2 liters per minute. Samples should be collected on 0.8 micrometer pore size membrane filter (37mm diameter). Volatile arsenicals such as arsenic

trichloride can be most easily collected in a midjet bubbler filled with 15 ml. of 0.1 N NaOH.

(ii) The method of sampling and analysis should have an accuracy of not less than ± 25 percent (with a confidence limit of 95 percent) for 10 micrograms per cubic meter of air ($10 \mu\text{g}/\text{m}^3$) and ± 35 percent (with a confidence limit of 95 percent) for concentrations of inorganic arsenic between 5 and $10 \mu\text{g}/\text{m}^3$.

(3) Appendix C—Medical surveillance guidelines.

(a) General.

(i) Medical examinations are to be provided for all employees exposed to levels of inorganic arsenic above the action level ($5 \mu\text{g}/\text{m}^3$) for at least 30 days per year (which would include among others, all employees, who work in regulated areas). Examinations are also to be provided to all employees who have had 10 years or more exposure above the action level for more than 30 days per year while working for the present or predecessor employer though they may no longer be exposed above the level.

(ii) An initial medical examination is to be provided to all such employees by December 1, 1978. In addition, an initial medical examination is to be provided to all employees who are first assigned to areas in which worker exposure will probably exceed $5 \mu\text{g}/\text{m}^3$ (after the effective date of this standard) at the time of initial assignment. In addition to its immediate diagnostic usefulness the initial examination will provide a baseline for comparing future test results. The initial examination must include as a minimum the following elements:

(A) A work and medical history, including a smoking history, and presence and degree of respiratory symptoms such as breathlessness, cough, sputum production, and wheezing;

(B) A 14-inch by 17-inch posterior-anterior chest x-ray and an International Labor Office UICC/Cincinnati (ILO U/C) rating;

(C) A nasal and skin examination; and

(D) Other examinations which the physician believes appropriate because of the employee's exposure to inorganic arsenic or because of required respirator use.

(iii) Periodic examinations are also to be provided to the employees listed above. The periodic examinations shall be given annually for those covered employees 45 years of age or less with fewer than 10 years employment in areas where employee exposure exceeds the action level ($5 \mu\text{g}/\text{m}^3$). Periodic examinations need not include sputum cytology and only an updated medical history is required.

(iv) Periodic examinations for other covered employees, shall be provided every 6 months. These examinations shall include all tests required in the initial examination, except that the medical history need only be updated.

(v) The examination contents are minimum requirements. Additional tests such as lateral and oblique x-rays or pulmonary function tests may be useful. For workers exposed to 3 arsenicals, copper acetoarsenite, potassium arsenite, or sodium arsenite, which are associated with lymphatic cancer, the examination should also include palpation of superficial lymph nodes and complete blood count.

(b) Noncarcinogenic effects.

(i) The WISHA standard is based on minimizing risk of exposed workers dying of lung cancer from exposure to inorganic arsenic. It will also minimize skin cancer from such exposures.

(ii) The following three sections quoted from "Occupational Diseases: A Guide to Their Recognition," Revised Edition, June 1977, National Institute for Occupational Safety and Health is included to provide information on the nonneoplastic effects of exposure to inorganic arsenic. Such effects should not occur if the WISHA standards are followed.

(A) Local—Trivalent arsenic compounds are corrosive to the skin. Brief contact has no effect but prolonged contact results in a local hyperemia and later vesicular or pustular eruption. The moist mucous membranes are most sensitive to the irritant action. Conjunctiva, moist and macerated areas of skin, the eyelids, the angles of the ears, nose, mouth, and respiratory mucosa are also vulnerable to the irritant effects. The wrists are common sites of dermatitis, as are the genitalia if personal hygiene is poor. Perforations of the nasal septum may occur. Arsenic trioxide and pentoxide are capable of producing skin sensitization and contact dermatitis. Arsenic is also capable of producing keratoses, especially of the palms and soles.

(B) Systemic.

(I) The acute toxic effects of arsenic are generally seen following ingestion of inorganic arsenical compounds. This rarely occurs in an industrial setting. Symptoms develop within 1/2 to 4 hours following ingestion and are usually characterized by constriction of the throat followed by dysphagia, epigastric pain, vomiting, and watery diarrhea. Blood may appear in vomitus and stools. If the amount ingested is sufficiently high, shock may develop due to severe fluid loss, and death may ensue in 24 hours. If the acute effects are survived, exfoliative dermatitis and peripheral neuritis may develop.

(II) Cases of acute arsenical poisoning due to inhalation are exceedingly rare in industry. When it does occur, respiratory tract symptoms - cough, chest pain, dyspnea - giddiness, headache, and extreme general weakness precede gastrointestinal symptoms. The acute toxic symptoms of trivalent arsenical poisoning are due to severe inflammation of the mucous membranes and greatly increased permeability of the blood capillaries.

(III) Chronic arsenical poisoning due to ingestion is rare and generally confined to patients taking prescribed medications. However, it can be a concomitant of inhaled inorganic arsenic from swallowed sputum and improper eating habits. Symptoms are weight loss, nausea and diarrhea alternating with constipation, pigmentation and eruption of the skin, loss of hair, and peripheral neuritis. Chronic hepatitis and cirrhosis have been described. Polyneuritis may be the salient feature, but more frequently there are numbness and parasthesias of "glove and stocking" distribution. The skin lesions are usually melanotic and keratotic and may occasionally take the form of an intradermal cancer of the squamous cell type, but without infiltrative properties. Horizontal white lines (striations) on the fingernails and toenails are commonly seen in chronic arsenical poisoning and are considered to be a diagnostic accompaniment of arsenical polyneuritis.

(IV) Inhalation of inorganic arsenic compounds is the most common cause of chronic poisoning in the industrial situation. This condition is divided into three phases based on signs and symptoms.

(V) First phase: The worker complains of weakness, loss of appetite, some nausea, occasional vomiting, a sense of heaviness in the stomach, and some diarrhea.

(VI) Second phase: The worker complains of conjunctivitis, a catarrhal state of the mucous membranes of the nose, larynx, and respiratory passage. Coryza, hoarseness, and mild tracheobronchitis may occur. Perforation of the nasal septum is common, and is probably the most typical lesion of the upper respiratory tract in occupational exposure to arsenical dust. Skin lesions, eczematoid and allergic in type, are common.

(VII) Third phase: The worker complains of symptoms of peripheral neuritis, initially of hands and feet, which is essentially sensory. In more severe cases, motor paralysis occurs; the first muscles affected are usually the toe extensors and the peronei. In only the most severe cases will paralysis of flexor muscles of the feet or of the extensor muscles of hands occur.

(VIII) Liver damage from chronic arsenical poisoning is still debated, and as yet the question is unanswered. In cases of chronic and acute arsenical poisoning, toxic effects to the myocardium have been reported based on EKG changes. These findings, however, are now largely discounted and the EKG changes are ascribed to electrolyte disturbances concomitant with arsenicalism. Inhalation of arsenic trioxide and other inorganic arsenical dusts does not give rise to radiological evidence or pneumoconiosis. Arsenic does have a depressant effect upon the bone marrow, with disturbances of both erythropoiesis and myelopoiesis.

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[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-62-07354, filed 8/17/99, effective 12/1/99; 98-02-030, § 296-62-07354, filed 12/31/97, effective 1/31/98. Statutory Authority: Chapter 49.17 RCW. 90-20-091 (Order 90-14), § 296-62-07354, filed 10/1/90, effective 11/15/90.]

WAC 296-62-07355 Ethylene oxide. Scope and application.

(1) WAC 296-62-07355 through 296-62-07389 applies to all occupational exposures to ethylene oxide (EtO), Chemical Abstracts Service Registry No. 75-21-8, except as provided in subsection (2) of this section.

(2) WAC 296-62-07355 through 296-62-07389 does not apply to the processing, use, or handling of products containing EtO where objective data are reasonably relied upon that demonstrate that the product is not capable of releasing EtO in airborne concentrations at or above the action level, and may not reasonably be foreseen to release EtO in excess of the excursion limit, under the expected conditions of processing, use, or handling that will cause the greatest possible release.

(3) Where products containing EtO are exempted under subsection (2) of this section, the employer shall maintain records of the objective data supporting that exemption and the basis for the employer's reliance on the data, as provided in WAC 296-62-07375(1).

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-62-07355, filed 11/22/91, effective 12/24/91; 88-23-054 (Order 88-25), § 296-62-07355, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07355, filed 11/30/87.]

WAC 296-62-07357 Definitions. For the purpose of WAC 296-62-07355 through 296-62-07389, the following definitions shall apply:

(1) "Action level" means a concentration of airborne EtO of 0.5 ppm calculated as an eight-hour time-weighted average.

(2) "Authorized person" means any person specifically authorized by the employer whose duties require the person to enter a regulated area, or any person entering such an area as a designated representative of employees for the purpose of exercising the right to observe monitoring and measuring procedures under WAC 296-62-07377, or any other person authorized by chapter 49.17 RCW or regulations issued under chapter 49.17 RCW.

(3) "Director" means the director of the department of labor and industries, or designee.

(4) "Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that is likely to or does result in an unexpected significant release of EtO.

(5) "Employee exposure" means exposure to airborne EtO which would occur if the employee were not using respiratory protective equipment.

(6) "Ethylene oxide" or "EtO" means the three-membered ring organic compound with chemical formula C₂H₄O.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07357, filed 11/30/87.]

WAC 296-62-07359 Permissible exposure limits (PEL). (1) Eight-hour time-weighted average (TWA). The employer shall ensure that no employee is exposed to an airborne concentration of EtO in excess of one part EtO per million parts of air (1 ppm) as an eight-hour time-weighted average. (Eight-hour TWA.)

(2) Excursion limit. The employer shall ensure that no employee is exposed to an airborne concentration of EtO in

excess of five parts of EtO per million parts of air (5 ppm) as averaged over a sampling period of fifteen minutes.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-62-07359, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07359, filed 11/30/87.]

WAC 296-62-07361 Exposure monitoring. (1) General.

(a) Determinations of employee exposure shall be made from breathing zone air samples that are representative of the eight-hour TWA and fifteen-minute short-term exposures of each employee.

(b) Representative eight-hour TWA employee exposure shall be determined on the basis of one or more samples representing full-shift exposure for each shift for each job classification in each work area. Representative fifteen-minute short-term employee exposures shall be determined on the basis of one or more samples representing fifteen-minute exposures associated with operations that are most likely to produce exposures above the excursion limit for each shift for each job classification in each work area.

(c) Where the employer can document that exposure levels are equivalent for similar operations in different work shifts, the employer need only determine representative employee exposure for that operation during one shift.

(2) Initial monitoring.

(a) Each employer who has a workplace or work operation covered by WAC 296-62-07355 through 296-62-07389, except as provided in WAC 296-62-07355 (2) or (b) of this subsection, shall perform initial monitoring to determine accurately the airborne concentrations of EtO to which employees may be exposed.

(b) Where the employer has monitored after June 15, 1983, and the monitoring satisfies all other requirements of WAC 296-62-07355 through 296-62-07389, the employer may rely on such earlier monitoring results to satisfy the requirements of (a) of this subsection.

(c) Where the employer has previously monitored for the excursion limit and the monitoring satisfies all other requirements of this section, the employer may rely on such earlier monitoring results to satisfy the requirements of (a) of this subsection.

(3) Monitoring frequency (periodic monitoring).

(a) If the monitoring required by subsection (2) of this section reveals employee exposure at or above the action level but at or below the eight-hour TWA, the employer shall repeat such monitoring for each such employee at least every six months.

(b) If the monitoring required by subsection (2)(a) of this section reveals employee exposure above the eight-hour TWA, the employer shall repeat such monitoring for each such employee at least every three months.

(c) The employer may alter the monitoring schedule from quarterly to semiannually for any employee for whom two consecutive measurements taken at least seven days apart indicate that the employee's exposure has decreased to or below the eight-hour TWA.

(d) If the monitoring required by subsection (2)(a) of this section reveals employee exposure above the fifteen-minute excursion limit, the employer shall repeat such monitoring

for each such employee at least every three months, and more often as necessary to evaluate the employee's short-term exposures.

(4) Termination of monitoring.

(a) If the initial monitoring required by subsection (2)(a) of this section reveals employee exposure to be below the action level, the employer may discontinue TWA monitoring for those employees whose exposures are represented by the initial monitoring.

(b) If the periodic monitoring required by subsection (3) of this section reveals that employee exposures, as indicated by at least two consecutive measurements taken at least seven days apart, are below the action level, the employer may discontinue TWA monitoring for those employees whose exposures are represented by such monitoring.

(c) If the initial monitoring required by subsection (2)(a) of this section reveals the employee exposure to be at or below the excursion limit, the employer may discontinue excursion limit monitoring for those employees whose exposures are represented by the initial monitoring.

(d) If the periodic monitoring required by subsection (3) of this section reveals that employee exposures, as indicated by at least two consecutive measurements taken at least seven days apart, are at or below the excursion limit, the employer may discontinue excursion limit monitoring for those employees whose exposures are represented by such monitoring.

(5) Additional monitoring. Notwithstanding the provisions of subsection (4) of this section, the employer shall institute the exposure monitoring required under subsections (2)(a) and (3) of this section whenever there has been a change in the production, process, control equipment, personnel or work practices that may result in new or additional exposures to EtO or when the employer has any reason to suspect that a change may result in new or additional exposures.

(6) Accuracy of monitoring.

(a) Monitoring shall be accurate, to a confidence level of ninety-five percent, to within plus or minus twenty-five percent for airborne concentrations of EtO at the 1 ppm TWA and to within plus or minus thirty-five percent for airborne concentrations of EtO at the action level of 0.5 ppm.

(b) Monitoring shall be accurate, to a confidence level of ninety-five percent, to within plus or minus thirty-five percent for airborne concentrations of EtO at the excursion limit.

(7) Employee notification of monitoring results.

(a) The employer shall, within fifteen working days after the receipt of the results of any monitoring performed under WAC 296-62-07355 through 296-62-07389, notify the affected employee of these results in writing either individually or by posting of results in an appropriate location that is accessible to affected employees.

(b) The written notification required by (a) of this subsection shall contain the corrective action being taken by the employer to reduce employee exposure to or below the TWA and/or excursion limit, wherever monitoring results indicated that the TWA and/or excursion limit has been exceeded.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-62-07361, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07361, filed 11/30/87.]

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WAC 296-62-07363 Regulated areas. (1) The employer shall establish a regulated area wherever occupational exposures to airborne concentrations of EtO may exceed the TWA or wherever the EtO concentration exceeds or can reasonably be expected to exceed the excursion limit.

(2) Access to regulated areas shall be limited to authorized persons.

(3) Regulated areas shall be demarcated in any manner that minimizes the number of employees within the regulated area.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-62-07363, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07363, filed 11/30/87.]

WAC 296-62-07365 Methods of compliance. (1) Engineering controls and work practices.

(a) The employer shall institute engineering controls and work practices to reduce and maintain employee exposure to or below the TWA and to or below the excursion limit, except to the extent that such controls are not feasible.

(b) Wherever the feasible engineering controls and work practices that can be instituted are not sufficient to reduce employee exposure to or below the TWA and to or below the excursion limit, the employer shall use them to reduce employee exposure to the lowest levels achievable by these controls and shall supplement them by the use of respiratory protection that complies with the requirements of WAC 296-62-07367.

(c) Engineering controls are generally infeasible for the following operations: Collection of quality assurance sampling from sterilized materials; removal of biological indicators from sterilized materials; Loading and unloading of tank cars; changing of ethylene oxide tanks on sterilizers; and vessel cleaning. For these operations, engineering controls are required only where the director demonstrates that such controls are feasible.

(2) Compliance program.

(a) Where the TWA or excursion limit is exceeded, the employer shall establish and implement a written program to reduce employee exposure to or below the TWA and to or below the excursion limit by means of engineering and work practice controls, as required by subsection (1) of this section, and by the use of respiratory protection where required or permitted under WAC 296-62-07355 through 296-62-07389.

(b) The compliance program shall include a schedule for periodic leak detection surveys and a written plan for emergency situations, as specified in WAC 296-62-07369 (1)(a).

(c) Written plans for a program required in this subsection shall be developed and furnished upon request for examination and copying to the director, affected employees and designated employee representatives. Such plans shall be reviewed at least every twelve months, and shall be updated as necessary to reflect significant changes in the status of the employer's compliance program.

(d) The employer shall not implement a schedule of employee rotation as a means of compliance with the TWA or excursion limit.

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[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-62-07365, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07365, filed 11/30/87.]

WAC 296-62-07367 Respiratory protection and personal protective equipment. (1) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of WAC 296-62-07355 through 296-62-07389. Respirators must be used during:

- (a) Periods necessary to install or implement feasible engineering and work-practice controls;
 - (b) Work operations, such as maintenance and repair activities, vessel cleaning, or other activities, for which engineering and work-practice controls are not feasible;
 - (c) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the TWA or excursion limit;
 - (d) Emergencies.
- (2) Respirator program. The employer must establish, implement, and maintain a respiratory protection program as required in chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).
- (3) Respirator selection. The employer must select the appropriate respirator from Table 1 of this section.

Table 1.—Minimum Requirements for Respiratory Protection for Airborne EtO

Condition of use or concentration of airborne EtO (ppm)	Minimum required respirator
Equal to or less than 50	(a) Full facepiece respirator with EtO approved canister, front-or back-mounted.
Equal to or less than 2,000	(a) Positive-pressure supplied air respirator, equipped with full facepiece, hood or helmet, or (b) Continuous-flow supplied air respirator (positive pressure) equipped with hood, helmet or suit.
Concentration above 2,000 or unknown concentration (such as in emergencies)	(a) Positive-pressure self-contained breathing apparatus (SCBA), equipped with full facepiece, or (b) Positive-pressure full facepiece supplied air respirator equipped with an auxiliary positive-pressure self-contained breathing apparatus.
Firefighting	(a) Positive pressure self-contained breathing apparatus equipped with full facepiece.
Escape	(a) Any respirator described above.

Note: Respirators approved for use in higher concentrations are permitted to be used in lower concentrations.

(4) Protective clothing and equipment. Where employees could have eye or skin contact with EtO or EtO solutions, the employer must select and provide, at no cost to the employee, appropriate protective clothing or other equipment in accordance with chapter 296-24 WAC, Part A-2, and to

protect any area of the body that may come in contact with liquid EtO or EtO in solution, and must ensure that the employee wears the protective clothing and equipment provided.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07367, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-62-07367, filed 9/30/94, effective 11/20/94; 88-23-054 (Order 88-25), § 296-62-07367, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07367, filed 11/30/87.]

WAC 296-62-07369 Emergency situations. (1) Written plan.

- (a) A written plan for emergency situations shall be developed for each workplace where there is a possibility of an emergency. Appropriate portions of the plan shall be implemented in the event of an emergency.
- (b) The plan shall specifically provide that employees engaged in correcting emergency conditions shall be equipped with respiratory protection as required by WAC 296-62-07367 until the emergency is abated.
- (c) The plan shall include the elements prescribed in WAC 296-24-567, "Employee emergency plans and fire prevention plans."

(2) Alerting employees. Where there is the possibility of employee exposure to EtO due to an emergency, means shall be developed to alert potentially affected employees of such occurrences promptly. Affected employees shall be immediately evacuated from the area in the event that an emergency occurs.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07369, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07369, filed 11/30/87.]

WAC 296-62-07371 Medical surveillance. (1) General.

- (a) Employees covered.
 - (i) The employer shall institute a medical surveillance program for all employees who are or may be exposed to EtO at or above the action level, without regard to the use of respirators, for at least thirty days a year.
 - (ii) The employer shall make available medical examinations and consultations to all employees who have been exposed to EtO in an emergency situation.
- (b) Examination by a physician. The employer shall ensure that all medical examinations and procedures are performed by or under the supervision of a licensed physician, and are provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(2) Medical examinations and consultations.

- (a) Frequency. The employer shall make available medical examinations and consultations to each employee covered under subsection (1)(a) of this section on the following schedules:

- (i) Prior to assignment of the employee to an area where exposure may be at or above the action level for at least thirty days a year.
- (ii) At least annually each employee exposed at or above the action level for at least thirty days in the past year.

(iii) At termination of employment or reassignment to an area where exposure to EtO is not at or above the action level for at least thirty days a year.

(iv) As medically appropriate for any employee exposed during an emergency.

(v) As soon as possible, upon notification by an employee either (A) that the employee has developed signs or symptoms indicating possible overexposure to EtO, or (B) that the employee desires medical advice concerning the effects of current or past exposure to EtO on the employee's ability to produce a healthy child.

(vi) If the examining physician determines that any of the examinations should be provided more frequently than specified, the employer shall provide such examinations to affected employees at the frequencies recommended by the physician.

(b) Content.

(i) Medical examinations made available pursuant to (a)(i) through (iv) of this subsection shall include:

(A) A medical and work history with special emphasis directed to symptoms related to the pulmonary, hematologic, neurologic, and reproductive systems and to the eyes and skin.

(B) A physical examination with particular emphasis given to the pulmonary, hematologic, neurologic, and reproductive systems and to the eyes and skin.

(C) A complete blood count to include at least a white cell count (including differential cell count), red cell count, hematocrit, and hemoglobin.

(D) Any laboratory or other test which the examining physician deems necessary by sound medical practice.

(ii) The content of medical examinations or consultation made available pursuant to (a)(i)(v) of this subsection shall be determined by the examining physician, and shall include pregnancy testing or laboratory evaluation of fertility, if requested by the employee and deemed appropriate by the physician.

(3) Information provided to the physician. The employer shall provide the following information to the examining physician:

(a) A copy of WAC 296-62-07355 through 296-62-07389.

(b) A description of the affected employee's duties as they relate to the employee's exposure.

(c) The employee's representative exposure level or anticipated exposure level.

(d) A description of any personal protective and respiratory equipment used or to be used.

(e) Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

(4) Physician's written opinion.

(a) The employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination and shall include:

(i) The physician's opinion as to whether the employee has any detected medical conditions that would place the employee at an increased risk of material health impairment from exposure to EtO;

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(ii) Any recommended limitations on the employee or upon the use of personal protective equipment such as clothing or respirators; and

(iii) A statement that the employee has been informed by the physician of the results of the medical examination and of any medical conditions resulting from EtO exposure that require further explanation or treatment.

(b) The employer shall instruct the physician not to reveal in the written opinion given to the employer specific findings or diagnoses unrelated to occupational exposure to EtO.

(c) The employer shall provide a copy of the physician's written opinion to the affected employee within fifteen days from its receipt.

[Statutory Authority: Chapter 49.17 RCW, 87-24-051 (Order 87-24), § 296-62-07371, filed 11/30/87.]

WAC 296-62-07373 Communication of EtO hazards to employees. (1) Signs and labels.

(a) The employer shall post and maintain legible signs demarcating regulated areas and entrances or accessways to regulated areas that bear the following legend:

DANGER
ETHYLENE OXIDE
CANCER HAZARD AND REPRODUCTIVE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING MAY BE REQUIRED
TO BE WORN IN THIS AREA

(b) The employer shall ensure that precautionary labels are affixed to all containers of EtO whose contents are capable of causing employee exposure at or above the action level or whose contents may reasonably be foreseen to cause employee exposure above the excursion limit, and that the labels remain affixed when the containers of EtO leave the workplace. For the purpose of this subsection, reaction vessels, storage tanks, and pipes or piping systems are not considered to be containers. The labels shall comply with the requirements of WAC 296-62-05411 of WISHA's hazard communication standard, and shall include the following legend:

(i)
DANGER
CONTAINS ETHYLENE OXIDE
CANCER HAZARD AND REPRODUCTIVE HAZARD; and

(ii) A warning statement against breathing airborne concentrations of EtO.

(c) The labeling requirements under WAC 296-62-07355 through 296-62-07389 do not apply where EtO is used as a pesticide, as such term is defined in the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et seq.), when it is labeled pursuant to that act and regulations issued under that act by the Environmental Protection Agency.

(2) Material safety data sheets. Employers who are manufacturers or importers of EtO shall comply with the requirements regarding development of material safety data sheets

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as specified in WAC 296-62-05413 of the hazard communication standard.

(3) Information and training.

(a) The employer shall provide employees who are potentially exposed to EtO at or above the action level or above the excursion limit with information and training on EtO at the time of initial assignment and at least annually thereafter.

(b) Employees shall be informed of the following:

(i) The requirements of WAC 296-62-07353 through 296-62-07389 with an explanation of its contents, including Appendices A and B;

(ii) Any operations in their work area where EtO is present;

(iii) The location and availability of the written EtO final rule; and

(iv) The medical surveillance program required by WAC 296-62-07371 with an explanation of the information in Appendix C.

(c) Employee training shall include at least:

(i) Methods and observations that may be used to detect the presence or release of EtO in the work area (such as monitoring conducted by the employer, continuous monitoring devices, etc.);

(ii) The physical and health hazards of EtO;

(iii) The measures employees can take to protect themselves from hazards associated with EtO exposure, including specific procedures the employer has implemented to protect employees from exposure to EtO, such as work practices, emergency procedures, and personal protective equipment to be used; and

(iv) The details of the hazard communication program developed by the employer, including an explanation of the labeling system and how employees can obtain and use the appropriate hazard information.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-62-07373, filed 11/14/88; 87-24-051 (Order 87-24), § 296-62-07373, filed 11/30/87.]

WAC 296-62-07375 Recordkeeping. (1) Objective data for exempted operations.

(a) Where the processing, use, or handling of products made from or containing EtO are exempted from other requirements of WAC 296-62-07355 through 296-62-07389 under WAC 296-62-07355, or where objective data have been relied on in lieu of initial monitoring under WAC 296-62-07361 (2)(b), the employer shall establish and maintain an accurate record of objective data reasonably relied upon in support of the exemption.

(b) This record shall include at least the following information:

(i) The product qualifying for exemption;

(ii) The source of the objective data;

(iii) The testing protocol, results of testing, and/or analysis of the material for the release of EtO;

(iv) A description of the operation exempted and how the data support the exemption; and

(v) Other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.

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(c) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

(2) Exposure measurements.

(a) The employer shall keep an accurate record of all measurements taken to monitor employee exposure to EtO as prescribed in WAC 296-62-07361.

(b) This record shall include at least the following information:

(i) The date of measurement;

(ii) The operation involving exposure to EtO which is being monitored;

(iii) Sampling and analytical methods used and evidence of their accuracy;

(iv) Number, duration, and results of samples taken;

(v) Type of protective devices worn, if any; and

(vi) Name, Social Security number and exposure of the employees whose exposures are represented.

(c) The employer shall maintain this record for at least thirty years, in accordance with WAC 296-62-05207.

(3) Medical surveillance.

(a) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance by WAC 296-62-07371 (1)(a), in accordance with WAC 296-62-05207.

(b) The record shall include at least the following information:

(i) The name and Social Security number of the employee;

(ii) Physicians' written opinions;

(iii) Any employee medical complaints related to exposure to EtO; and

(iv) A copy of the information provided to the physician as required by WAC 296-62-07371(3).

(c) The employer shall ensure that this record is maintained for the duration of employment plus thirty years, in accordance with WAC 296-62-05207.

(4) Availability.

(a) The employer, upon written request, shall make all records required to be maintained by WAC 296-62-07355 through 296-62-07389 available to the director for examination and copying.

(b) The employer, upon request, shall make any exemption and exposure records required by WAC 296-62-07377 (1) and (2) available for examination and copying to affected employees, former employees, designated representatives and the director, in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(c) The employer, upon request, shall make employee medical records required by subsection (3) of this section available for examination and copying to the subject employee, anyone having the specific written consent of the subject employee, and the director, in accordance with WAC 296-62-052.

(5) Transfer of records.

(a) The employer shall comply with the requirements concerning transfer of records set forth in WAC 296-62-05215.

(b) Whenever the employer ceases to do business and there is no successor employer to receive and retain the

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records for the prescribed period, the employer shall notify the director at least ninety days prior to disposal and transmit them to the director.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07375, filed 11/30/87.]

WAC 296-62-07377 Observation of monitoring. (1) Employee observation. The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to EtO conducted in accordance with WAC 296-62-07361.

(2) Observation procedures. When observation of the monitoring of employee exposure to EtO requires entry into an area where the use of protective clothing or equipment is required, the observer shall be provided with and be required to use such clothing and equipment and shall comply with all other applicable safety and health procedures.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07377, filed 11/30/87.]

WAC 296-62-07381 Appendices. The information contained in the appendices is not intended by itself to create any additional obligations not otherwise imposed or to detract from any existing obligation.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07381, filed 11/30/87.]

WAC 296-62-07383 Appendix A—Substance safety data sheet for ethylene oxide (nonmandatory). (1) **Substance identification**

(a) Substance: Ethylene oxide (C₂H₄O).

(b) Synonyms: Dihydrooxirene, dimethylene oxide, EO, 1,2-epoxyethane, EtO, ETO, oxacyclopropane, oxane, oxidoethane, alpha/beta-oxidoethane, oxirane, oxirane.

(c) Ethylene oxide can be found as a liquid or vapor.

(d) EtO is used in the manufacture of ethylene glycol, surfactants, ethanalamines, glycol ethers, and other organic chemicals. EtO is also used as a sterilant and fumigant.

(e) Appearance and odor: Colorless liquid below 10.7°C (51.3°F) or colorless gas with ether-like odor detected at approximately 700 parts EtO per million parts of air (700 ppm).

(f) Permissible exposure: Exposure may not exceed 1 part EtO per million parts of air averaged over the 8-hour work day.

(2) Health hazard data

(a) Ethylene oxide can cause bodily harm if you inhale the vapor, if it comes into contact with your eyes or skin, or if you swallow it.

(b) Effects of overexposure:

(i) Ethylene oxide in liquid form can cause eye irritation and injury to the cornea, frostbite, and severe irritation and blistering of the skin upon prolonged or confined contact. Ingestion of EtO can cause gastric irritation and liver injury. Acute effects from inhalation of EtO vapors include respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, shortness of breath, and cyanosis (blue or purple coloring of skin). Exposure has also been associated with the

occurrence of cancer, reproductive effects, mutagenic changes, neurotoxicity, and sensitization.

(ii) EtO has been shown to cause cancer in laboratory animals and has been associated with higher incidences of cancer in humans. Adverse reproductive effects and chromosomal damage may also occur from EtO exposure.

(c) Reporting signs and symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to EtO.

(3) Emergency first aid procedures

(a) Eye exposure: If EtO gets into your eyes, wash your eyes immediately with large amounts of water, lifting the lower and upper eyelids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

(b) Skin exposure: If EtO gets on your skin, immediately wash the contaminated skin with water. If EtO soaks through your clothing, especially your shoes, remove the clothing immediately and wash the skin with water using an emergency deluge shower. Get medical attention immediately. Thoroughly wash contaminated clothing before reusing. Contaminated leather shoes or other leather articles should not be reused and should be discarded.

(c) Inhalation: If large amounts of EtO are inhaled, the exposed person must be moved to fresh air at once. If breathing has stopped, perform cardiopulmonary resuscitation. Keep the affected person warm and at rest. Get medical attention immediately.

(d) Swallowing: When EtO has been swallowed, give the person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him or her touch the back of the throat with his or her finger. Do not make an unconscious person vomit. Get medical attention immediately.

(e) Rescue: Move the affected person from the hazardous exposure. If the exposed person has been overcome, attempt rescue only after notifying at least one other person of the emergency and putting into effect established emergency procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the location of the emergency equipment before the need arises.

(4) Respirators and protective clothing

(a) Respirators:

(i) You may be required to wear a respirator for nonroutine activities, in emergencies, while your employer is in the process of reducing EtO exposure through engineering controls, and in areas where engineering controls are not feasible. Only air supplied positive-pressure, full-facepiece respirators are approved for protection against EtO. If air-purifying respirators are worn in the future, they must have a label issued by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 42 CFR part 84 stating that the respirators have been certified for use with ethylene oxide. For effective protection, respirators must fit your face and head snugly. Respirators must not be loosened or removed in work situations where their use is required.

(ii) EtO does not have a detectable odor except at levels well above the permissible exposure limits. If you can smell EtO while wearing a respirator, proceed immediately to fresh

air. If you experience difficulty breathing while wearing a respirator, tell your employer.

(b) Protective clothing:

(i) You may be required to wear impermeable clothing, gloves, a face shield, or other appropriate protective clothing to prevent skin contact with liquid EtO or EtO-containing solutions. Where protective clothing is required, your employer must provide clean garments to you as necessary to assure that the clothing protects you adequately.

(ii) Replace or repair protective clothing that has become torn or otherwise damaged.

(iii) EtO must never be allowed to remain on the skin. Clothing and shoes which are not impermeable to EtO should not be allowed to become contaminated with EtO, and if they do, the clothing should be promptly removed and decontaminated. Contaminated leather shoes should be discarded. Once EtO penetrates shoes or other leather articles, they should not be worn again.

(c) Eye protection: You must wear splashproof safety goggles in areas where liquid EtO or EtO-containing solutions may contact your eyes. In addition, contact lenses should not be worn in areas where eye contact with EtO can occur.

(5) Precautions for safe use, handling, and storage

(a) EtO is a flammable liquid, and its vapors can easily form explosive mixtures in air.

(b) EtO must be stored in tightly closed containers in a cool, well-ventilated area, away from heat, sparks, flames, strong oxidizers, alkalines, and acids, strong bases, acetylide forming metals such as copper, silver, mercury and their alloys.

(c) Sources of ignition such as smoking material, open flames and some electrical devices are prohibited wherever EtO is handled, used, or stored in a manner that could create a potential fire or explosion hazard.

(d) You should use nonsparking tools when opening or closing metal containers of EtO, and containers must be bonded and grounded in the rare instances in which liquid EtO is poured or transferred.

(e) Impermeable clothing wet with liquid EtO or EtO-containing solutions may be easily ignited. If you are wearing impermeable clothing and are splashed with liquid EtO or EtO-containing solution, you should immediately remove the clothing while under an emergency deluge shower.

(f) If your skin comes into contact with liquid EtO or EtO-containing solutions, you should immediately remove the EtO using an emergency deluge shower.

(g) You should not keep food, beverages, or smoking materials in regulated areas where employee exposures are above the permissible exposure limits.

(h) Fire extinguishers and emergency deluge showers for quick drenching should be readily available, and you should know where they are and how to operate them.

(i) Ask your supervisor where EtO is used in your work area and for any additional plant safety and health rules.

(6) Access to information

(a) Each year, your employer is required to inform you of the information contained in this standard and appendices for EtO. In addition, your employer must instruct you in the

proper work practices for using EtO emergency procedures, and the correct use of protective equipment.

(b) Your employer is required to determine whether you are being exposed to EtO. You or your representative has the right to observe employee measurements and to record the results obtained. Your employer is required to inform you of your exposure. If your employer determines that you are being overexposed, he or she is required to inform you of the actions which are being taken to reduce your exposure to within permissible exposure limits.

(c) Your employer is required to keep records of your exposures and medical examinations. These exposure records must be kept by the employer for at least thirty years. Medical records must be kept for the period of your employment plus thirty years.

(d) Your employer is required to release your exposure and medical records to your physician or designated representative upon your written request.

(7) Sterilant use of EtO in hospitals and health care facilities.

(a) This section of Appendix A, for informational purposes, sets forth EPA's recommendations for modifications in workplace design and practice in hospitals and health care facilities for which the Environmental Protection Agency has registered EtO for uses as a sterilant or fumigant under the Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 136 *et seq.* These new recommendations, published in the **Federal Register** by EPA at 49 FR 15268, as modified in today's **Register**, are intended to help reduce the exposure of hospital and health care workers to EtO to 1 ppm. EPA's recommended workplace design and workplace practice are as follows:

(i) Workplace design

(A) Installation of gas line hand valves. Hand valves must be installed on the gas supply line at the connection to the supply cylinders to minimize leakage during cylinder change.

(B) Installation of capture boxes. Sterilizer operations result in a gas/water discharge at the completion of the process. This discharge is routinely piped to a floor drain which is generally located in an equipment or an adjacent room. When the floor drain is not in the same room as the sterilizer and workers are not normally present, all that is necessary is that the room be well ventilated.

(C) The installation of a "capture box" will be required for those work place layouts where the floor drain is located in the same room as the sterilizer or in a room where workers are normally present. A "capture box" is a piece of equipment that totally encloses the floor drain where the discharge from the sterilizer is pumped. The "capture box" is to be vented directly to a nonrecirculating or dedicated ventilation system. Sufficient air intake should be allowed at the bottom of the box to handle the volume of air that is ventilated from the top of the box. The "capture box" can be made of metal, plastic, wood or other equivalent material. The box is intended to reduce levels of EtO discharged into the work room atmosphere. The use of a "capture box" is not required if: (I) The vacuum pump discharge floor drain is located in a well ventilated equipment or other room where workers are not normally present or (II) the water sealed vacuum pump dis-

charges directly to a closed sealed sewer line (check local plumbing codes).

(D) If it is impractical to install a vented "capture box" and a well ventilated equipment or other room is not feasible, a box that can be sealed over the floor drain may be used if: (I) The floor drain is located in a room where workers are not normally present and EtO cannot leak into an occupied area, and (II) the sterilizer in use is less than 12 cubic feet in capacity (check local plumbing codes).

(ii) **Ventilation of aeration units.**

(A) Existing aeration units. Existing units must be vented to a nonrecirculating or dedicated system or vented to an equipment or other room where workers are not normally present and which is well ventilated. Aerator units must be positioned as close as possible to the sterilizer to minimize the exposure from the off-gassing of sterilized items.

(B) Installation of new aerator units (where none exist). New aerator units must be vented as described above for existing aerators. Aerators must be in place by July 1, 1986.

(iii) Ventilation during cylinder change. Workers may be exposed to short but relatively high levels of EtO during the change of gas cylinders. To reduce exposure from this route, users must select one of three alternatives designed to draw off gas that may be released when the line from the sterilizer to the cylinder is disconnected:

(A) Location of cylinders in a well ventilated equipment room or other room where workers are not normally present.

(B) Installation of a flexible hose (at least four inches in diameter) to a nonrecirculating or dedicated ventilation system and located in the area of cylinder change in such a way that the hose can be positioned at the point where the sterilizer gas line is disconnected from the cylinder.

(C) Installation of a hood that is part of a nonrecirculating or dedicated system and positioned no more than one foot above the point where the change of cylinders takes place.

(iv) Ventilation of sterilizer door area. One of the major sources of exposure to EtO occurs when the sterilizer door is opened following the completion of the sterilization process. In order to reduce this avenue of exposure, a hood or metal canopy closed on each end must be installed over the sterilizer door. The hood or metal canopy must be connected to a nonrecirculating or dedicated ventilation system or one that exhausts gases to a well ventilated equipment or other room where workers are not normally present. A hood or canopy over the sterilizer door is required for use even with those sterilizers that have a purge cycle and must be in place by July 1, 1986.

(v) Ventilation of sterilizer relief valve. Sterilizers are typically equipped with a safety relief device to release gas in case of increased pressure in the sterilizer. Generally, such relief devices are used on pressure vessels. Although these pressure relief devices are rarely opened for hospital and health care sterilizers, it is suggested that they be designed to exhaust vapor from the sterilizer by one of the following methods:

(A) Through a pipe connected to the outlet of the relief valve ventilated directly outdoors at a point high enough to be away from passers by, and not near any windows that open, or near any air conditioning or ventilation air intakes.

(B) Through a connection to an existing or new nonrecirculating or dedicated ventilation system.

(C) Through a connection to a well ventilated equipment or other room where workers are not normally present.

(vi) Ventilation systems. Each hospital and health care facility affected by this notice that uses EtO for the sterilization of equipment and supplies must have a ventilation system which enables compliance with the requirements of (a)(i)(B) through (v) of this subsection in the manner described in these sections and within the timeframes allowed. Thus, each affected hospital and health care facility must have or install a nonrecirculating or dedicated ventilation equipment or other room where workers are not normally present in which to vent EtO.

(vii) Installation of alarm systems. An audible and visual indicator alarm system must be installed to alert personnel of ventilation system failures, i.e., when the ventilation fan motor is not working.

(b) **Workplace practices**

(i) All the workplace practices discussed in this unit must be permanently posted near the door of each sterilizer prior to use by any operator.

(ii) **Changing of supply line filters.**

Filters in the sterilizer liquid line must be changed when necessary, by the following procedure:

(A) Close the cylinder valve and the hose valve.

(B) Disconnect the cylinder hose (piping) from the cylinder.

(C) Open the hose valve and bleed slowly into a proper ventilating system at or near the in-use supply cylinders.

(D) Vacate the area until the line is empty.

(E) Change the filter.

(F) Reconnect the lines and reverse the valve position.

(G) Check hoses, filters, and valves for leaks with a fluorocarbon leak detector (for those sterilizers using the eighty-eight percent chlorofluorocarbon, twelve percent ethylene oxide mixture (12/88)).

(iii) **Restricted access area.**

(A) Areas involving use of EtO must be designated as restricted access areas. They must be identified with signs or floor marks near the sterilizer door, aerator, vacuum pump floor drain discharge, and in-use cylinder storage.

(B) All personnel must be excluded from the restricted area when certain operations are in progress, such as discharging a vacuum pump, emptying a sterilizer liquid line, or venting a nonpurge sterilizer with the door ajar or other operations where EtO might be released directly into the face of workers.

(iv) **Door opening procedures.**

(A) Sterilizers with purge cycles. A load treated in a sterilizer equipped with a purge cycle should be removed immediately upon completion of the cycle (provided no time is lost opening the door after cycle is completed). If this is not done, the purge cycle should be repeated before opening door.

(B) Sterilizers without purge cycles. For a load treated in a sterilizer not equipped with a purge cycle, the sterilizer door must be ajar six inches for fifteen minutes, and then fully opened for at least another fifteen minutes before removing the treated load. The length of time of the second period should be established by peak monitoring for one hour after

the two fifteen-minute periods suggested. If the level is above 10 ppm time-weighted average for eight hours, more time should be added to the second waiting period (door wide open). However, in no case may the second period be shortened to less than fifteen minutes.

(v) **Chamber unloading procedures.**

(A) Procedures for unloading the chamber must include the use of baskets or rolling carts, or baskets and rolling tables to transfer treated loads quickly, thus avoiding excessive contact with treated articles, and reducing the duration of exposures.

(B) If rolling carts are used, they should be pulled not pushed by the sterilizer operators to avoid offgassing exposure.

(vi) Maintenance. A written log should be instituted and maintained documenting the date of each leak detection and any maintenance procedures undertaken. This is a suggested use practice and is not required.

(vii) Leak detection. Sterilizer door gaskets, cylinder and vacuum piping, hoses, filters, and valves must be checked for leaks under full pressure with a Fluorocarbon leak detector (for 12/88 systems only) every two weeks by maintenance personnel. Also, the cylinder piping connections must be checked after changing cylinders. Particular attention in leak detection should be given to the automatic solenoid valves that control the flow of EtO to the sterilizer. Specifically, a check should be made at the EtO gasline entrance port to the sterilizer, while the sterilizer door is open and the solenoid valves are in a closed position.

(viii) Maintenance procedures. Sterilizer/aerator door gaskets, valves, and fittings must be replaced when necessary as determined by maintenance personnel in their biweekly checks; in addition, visual inspection of the door gaskets for cracks, debris, and other foreign substances should be conducted daily by the operator.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07383, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-62-07383, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-07383, filed 11/30/87.]

WAC 296-62-07385 Appendix B—Substance technical guidelines for ethylene oxide (nonmandatory). (1) Physical and chemical data:

(a) Substance identification:

(i) Synonyms: Dihydrooxirene, dimethylene oxide, EO, 1,2-epoxyethane, EtO, ETO, oxacyclopropane, oxane, oxidethane, alpha/beta-oxidoethane, oxiran, oxirane.

(ii) Formula: (C₂H₄O).

(iii) Molecular weight: 44.06.

(b) Physical data:

(i) Boiling point (760 mm Hg): 10.70°C (51.3°F);

(ii) Specific gravity (water = 1): 0.87 (at 20°C or 68°F);

(iii) Vapor density (air = 1): 1.49;

(iv) Vapor pressure (at 20°C): 1,095 mm Hg;

(v) Solubility in water: Complete;

(vi) Appearance and odor: Colorless liquid; gas at temperature above 10.7°F or 51.3°C with ether-like odor above 700 ppm.

(2) Fire, explosion, and reactivity hazard data:

(a) Fire:

(i) Flash point; Less than 0°F (open cup);
(ii) Stability: Decomposes violently at temperatures above 800°F;

(iii) Flammable limits in air, percent by volume: Lower: 3, Upper: 100;

(iv) Extinguishing media: Carbon dioxide for small fires, polymer or alcohol foams for large fires;

(v) Special fire fighting procedures: Dilution of ethylene oxide with 23 volumes of water renders it nonflammable;

(vi) Unusual fire and explosion hazards: Vapors of EtO will burn without the presence of air or other oxidizers. EtO vapors are heavier than air and may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which EtO is being used.

(vii) For purposes of compliance with the requirements of WAC 296-24-330, EtO is classified as a flammable gas. For example, 7,500 ppm, approximately one-fourth of the lower flammable limit, would be considered to pose a potential fire and explosion hazard.

(viii) For purposes of compliance with WAC 296-24-585, EtO is classified as a Class B fire hazard.

(ix) For purpose of compliance with chapter 296-24 WAC Part L, locations classified as hazardous due to the presence of EtO shall be Class I.

(b) Reactivity:

(i) Conditions contributing to instability: EtO will polymerize violently if contaminated with aqueous alkalis, amines, mineral acids, metal chlorides, or metal oxides. Violent decomposition will also occur at temperatures above 800°F;

(ii) Incompatibilities: Alkalines and acids;

(iii) Hazardous decomposition products: Carbon monoxide and carbon dioxide.

(3) Spill, leak, and disposal procedures:

(a) If EtO is spilled or leaked, the following steps should be taken:

(i) Remove all ignition sources.

(ii) The area should be evacuated at once and re-entered only after the area has been thoroughly ventilated and washed down with water.

(b) Persons not wearing appropriate protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.

(c) Waste disposal method: Waste material should be disposed of in a manner that is not hazardous to employees or to the general population. In selecting the method of waste disposal, applicable local, state, and federal regulations should be consulted.

(4) Monitoring and measurement procedures:

(a) Exposure above the permissible exposure limit:

(i) Eight-hour exposure evaluation: Measurements taken for the purpose of determining employee exposure under this section are best taken with consecutive samples covering the full shift. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee.)

(ii) Monitoring techniques: The sampling and analysis under this section may be performed by collection of the EtO vapor on charcoal adsorption tubes or other composition adsorption tubes, with subsequent chemical analysis. Sam-

pling and analysis may also be performed by instruments such as real time continuous monitoring systems, portable direct reading instruments, or passive dosimeters as long as measurements taken using these methods accurately evaluate the concentration of EtO in employees' breathing zones.

(iii) Appendix D describes the validated method of sampling and analysis which has been tested by OSHA for use with EtO. Other available methods are also described in Appendix D. The employer has the obligation of selecting a monitoring method which meets the accuracy and precision requirements of the standard under his/her unique field conditions. The standard requires that the method of monitoring should be accurate, to a 95 percent confidence level, to plus or minus 25 percent for concentrations of EtO at 1 ppm, and to plus or minus 35 percent for concentrations at 0.5 ppm. In addition to the method described in Appendix D, there are numerous other methods available for monitoring for EtO in the workplace. Details on these other methods have been submitted by various companies to the rulemaking record, and are available at the OSHA Docket Office.

(b) Since many of the duties relating to employee exposure are dependent on the results of measurement procedures, employers should assure that the evaluation of employee exposures is performed by a technically qualified person.

(5) Protective clothing and equipment:

(a) Employees should be provided with and be required to wear appropriate protective clothing wherever there is significant potential for skin contact with liquid EtO or EtO-containing solutions. Protective clothing shall include impermeable coveralls or similar full-body work clothing, gloves, and head coverings, as appropriate to protect areas of the body which may come in contact with liquid EtO or EtO-containing solutions.

(b) Employers should ascertain that the protective garments are impermeable to EtO. Permeable clothing, including items made of rubber, and leather shoes should not be allowed to become contaminated with liquid EtO. If permeable clothing does become contaminated, it should be immediately removed, while the employer is under an emergency deluge shower. If leather footwear or other leather garments become wet from EtO they should be discarded and not be worn again, because leather absorbs EtO and holds it against the skin.

(c) Any protective clothing that has been damaged or is otherwise found to be defective should be repaired or replaced. Clean protective clothing should be provided to the employee as necessary to assure employee protection. Whenever impermeable clothing becomes wet with liquid EtO, it should be washed down with water before being removed by the employee. Employees are also required to wear splash-proof safety goggles where there is any possibility of EtO contacting the eyes.

(6) Miscellaneous precautions:

(a) Store EtO in tightly closed containers in a cool, well-ventilated area and take all necessary precautions to avoid any explosion hazard.

(b) Nonsparking tools must be used to open and close metal containers. These containers must be effectively grounded and bonded.

(c) Do not incinerate EtO cartridges, tanks or other containers.

(d) Employers should advise employees of all areas and operations where exposure to EtO occurs.

(7) Common operations:

Common operations in which exposure to EtO is likely to occur include the following: (a) Manufacture of EtO, (b) surfactants, (c) ethanolamines, (d) glycol ethers, (e) specialty chemicals, and (f) use as a sterilant in the hospital, health product and spice industries.

[Statutory Authority: Chapter 49.17 RCW, 91-24-017 (Order 91-07), § 296-62-07385, filed 11/22/91, effective 12/24/91; 88-14-108 (Order 88-11), § 296-62-07385, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-07385, filed 11/30/87.]

WAC 296-62-07387 Appendix C—Medical surveillance guidelines for ethylene oxide (nonmandatory). (1)

Route of entry: Inhalation.

(2) Toxicology:

(a) Clinical evidence of adverse effects associated with the exposure to EtO is present in the form of increased incidence of cancer in laboratory animals (leukemia, stomach, brain), mutation in offspring in animals, and resorptions and spontaneous abortions in animals and human populations respectively. Findings in humans and experimental animals exposed to airborne concentrations of EtO also indicate damage to the genetic material (DNA). These include hemoglobin alkylation, unscheduled DNA synthesis, sister chromatid exchange chromosomal aberration, and functional sperm abnormalities.

(b) Ethylene oxide in liquid form can cause eye irritation and injury to the cornea, frostbite, severe irritation, and blistering of the skin upon prolonged or confined contact. Ingestion of EtO can cause gastric irritation and liver injury. Other effects from inhalation of EtO vapors include respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, dyspnea and cyanosis.

(3) Signs and symptoms of acute overexposure:

(a) The early effects of acute overexposure to EtO are nausea and vomiting, headache, and irritation of the eyes and respiratory passages. The patient may notice a "peculiar taste" in the mouth. Delayed effects can include pulmonary edema, drowsiness, weakness, and incoordination. Studies suggest that blood cell changes, an increase in chromosomal aberrations, and spontaneous abortion may also be casually related to acute overexposure to EtO.

(b) Skin contact with liquid or gaseous EtO causes characteristic burns and possible even an allergic-type sensitization. The edema and erythema occurring from skin contact with EtO progress to vesiculation with a tendency to coalesce into blebs with desquamation. Healing occurs within three weeks, but there may be a residual brown pigmentation. A 40-80% solution is extremely dangerous, causing extensive blistering after only brief contact. Pure liquid EtO causes frostbite because of rapid evaporation. In contrast, the eye is relatively insensitive to EtO, but there may be some irritation of the cornea.

(c) Most reported acute effects of occupational exposure to EtO are due to contact with EtO in liquid phase. The liquid readily penetrates rubber and leather, and will produce blis-

tering if clothing or footwear contaminated with EtO are not removed.

(4) Surveillance and preventive considerations:

(a) As noted above, exposure to EtO has been linked to an increased risk of cancer and reproductive effects including decreased male fertility, fetotoxicity, and spontaneous abortion. EtO workers are more likely to have chromosomal damage than similar groups not exposed to EtO. At the present, limited studies of chronic effects in humans resulting from exposure to EtO suggest a causal association with leukemia. Animal studies indicate leukemia and cancers at other sites (brain, stomach) as well. The physician should be aware of the findings of these studies in evaluating the health of employees exposed to EtO.

(b) Adequate screening tests to determine an employee's potential for developing serious chronic diseases, such as cancer, from exposure to EtO do not presently exist. Laboratory tests may, however, give evidence to suggest that an employee is potentially overexposed to EtO. It is important for the physician to become familiar with the operating conditions in which exposure to EtO is likely to occur. The physician also must become familiar with the signs and symptoms that indicate a worker is receiving otherwise unrecognized and unacceptable exposure to EtO. These elements are especially important in evaluating the medical and work histories and in conducting the physical exam. When an unacceptable exposure in an active employee is identified by the physician, measures taken by the employer to lower exposure should also lower the risk of serious long-term consequences.

(c) The employer is required to institute a medical surveillance program for all employees who are or will be exposed to EtO at or above the action level (0.5 ppm) for at least 30 days per year, without regard to respirator use. All examinations and procedures must be performed by or under the supervision of a licensed physician at a reasonable time and place for the employee and at no cost to the employee.

(d) Although broad latitude in prescribing specific tests to be included in the medical surveillance program is extended to the examining physician, WISHA requires inclusion of the following elements in the routine examination:

(i) Medical and work histories with special emphasis directed to symptoms related to the pulmonary, hematologic, neurologic, and reproductive systems and to the eyes and skin.

(ii) Physical examination with particular emphasis given to the pulmonary, hematologic, neurologic, and reproductive systems and to the eyes and skin.

(iii) Complete blood count to include at least a white cell count (including differential cell count), red cell count, hematocrit, and hemoglobin.

(iv) Any laboratory or other test which the examining physician deems necessary by sound medical practice.

(e) If requested by the employee, the medical examinations shall include pregnancy testing or laboratory evaluation of fertility as deemed appropriate by the physician.

(f) In certain cases, to provide sound medical advice to the employer and the employee, the physician must evaluate situations not directly related to EtO. For example, employees with skin diseases may be unable to tolerate wearing protective clothing. In addition those with chronic respiratory

diseases may not tolerate the wearing of negative pressure (air purifying) respirators. Additional tests and procedures that will help the physician determine which employees are medically unable to wear such respirators should include: An evaluation of cardiovascular function, a baseline chest x-ray to be repeated at five year intervals, and a pulmonary function test to be repeated every three years. The pulmonary function test should include measurement of the employee's forced vital capacity (FVC), forced expiratory volume at one second (FEV1), as well as calculation of the ratios of FEV1 to FVC, and measured FVC and measured FEV1 to expected values corrected for variation due to age, sex, race, and height.

(g) The employer is required to make the prescribed tests available at least annually to employees who are or will be exposed at or above the action level, for 30 or more days per year; more often than specified if recommended by the examining physician; and upon the employee's termination of employment or reassignment to another work area. While little is known about the long-term consequences of high short-term exposures, it appears prudent to monitor such affected employees closely in light of existing health data. The employer shall provide physician recommended examinations to any employee exposed to EtO in emergency conditions. Likewise, the employer shall make available medical consultations including physician recommended exams to employees who believe they are suffering signs or symptoms of exposure to EtO.

(h) The employer is required to provide the physician with the following information: A copy of this standard and its appendices; a description of the affected employee's duties as they relate to the employee exposure level; and information from the employee's previous medical examinations which is not readily available to the examining physician. Making this information available to the physician will aid in the evaluation of the employee's health in relation to assigned duties and fitness to wear personal protective equipment, when required.

(i) The employer is required to obtain a written opinion from the examining physician containing the results of the medical examinations; the physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of his or her health from exposure to EtO; any recommended restrictions upon the employee's exposure to EtO, or upon the use of protective clothing or equipment such as respirators; and a statement that the employee has been informed by the physician of the results of the medical examination and of any medical conditions which require further explanation or treatment. This written opinion must not reveal specific findings or diagnoses unrelated to occupational exposure to EtO, and a copy of the opinion must be provided to the affected employee.

(j) The purpose in requiring the examining physician to supply the employer with a written opinion is to provide the employer with a medical basis to aid in the determination of initial placement of employees and to assess the employee's ability to use protective clothing and equipment.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-62-07387, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-07387, filed 11/30/87.]

WAC 296-62-07389 Appendix D—Sampling and analytical methods for ethylene oxide (nonmandatory).

(1) A number of methods are available for monitoring employee exposures to EtO. Most of these involve the use of charcoal tubes and sampling pumps, followed by analysis of the samples by gas chromatograph. The essential differences between the charcoal tube methods include, among others, the use of different desorbing solvents, the use of different lots of charcoal, and the use of different equipment for analysis of the samples. Besides charcoal, methods using passive dosimeters, gas sampling bags, impingers, and detector tubes have been utilized for determination of EtO exposure. In addition, there are several commercially available portable gas analyzers and monitoring units. This appendix contains details for the method which has been tested at the OSHA Analytical Laboratory in Salt Lake City. Inclusion of this method in the appendix does not mean that this method is the only one which will be satisfactory. Copies of descriptions of other methods available are available in the rulemaking record, and may be obtained from the OSHA Docket Office. These include the Union Carbide, Dow Chemical, 3M, and DuPont methods, as well as NIOSH Method S-286. These methods are briefly described at the end of this appendix.

(2) Employers who note problems with sample breakthrough using the OSHA or other charcoal methods should try larger charcoal tubes. Tubes of larger capacity are available. In addition, lower flow rates and shorter sampling times should be beneficial in minimizing breakthrough problems. Whatever method the employer chooses, he/she must assure himself/herself of the method's accuracy and precision under the unique conditions present in his workplace.

(3) Ethylene oxide:

(a) Method No.: 30.

(b) Matrix: Air.

(i) Target concentration: 1.0 ppm (1.8 mg/m³)

(ii) Procedure: Samples are collected on two charcoal tubes in series and desorbed with 1% CS₂ in benzene. The samples are derivatized with HBr and treated with sodium carbonate. Analysis is done by gas chromatography with an electron capture detector.

(iii) Recommended air volume and sampling rate: 1 liter and 0.05 Lpm.

(iv) Detection limit of the overall procedure: 13.3 ppb (0.024 mg/m³) (based on 1.0 liter air sample).

(v) Reliable quantitation limit: 52.2 ppb (0.094 mg/m³) (based on 1.0 liter air sample).

(vi) Standard error of estimate: 6.59% (see backup section 4.6).

(vii) Special requirements: Samples must be analyzed within 15 days of sampling date.

(viii) Status of method: The sampling and analytical method has been subject to the established evaluation procedures of the Organic Method Evaluations Branch.

(c) Date: August 1981.

(d) Chemist: Wayne D. Potter

(e) Organic Solvents Branch, OSHA Analytical Laboratory, Salt Lake City, Utah

(f) General discussion:

(i) Background.

(A) History of procedure.

(I) Ethylene oxide samples analyzed at the OSHA laboratory have normally been collected on activated charcoal and desorbed with carbon disulfide. The analysis is performed with a gas chromatograph equipped with a FID (flame ionization detector) as described in NIOSH Method S286 (Ref. (3)(j)(i)). This method is based on a PEL of 50 ppm and has a detection limit of about 1 ppm.

(II) Recent studies have prompted the need for a method to analyze and detect ethylene oxide at very low concentrations.

(III) Several attempts were made to form an ultraviolet (UV) sensitive derivative with ethylene oxide for analysis with HPLC. Among those tested that gave no detectable product were: p-anisidine, methylimidazole, aniline, and 2,3,6-trichlorobenzoic acid. Each was tested with catalysts such as triethylamine, aluminum chloride, methylene chloride and sulfuric acid but no detectable derivative was produced.

(IV) The next derivatization attempt was to react ethylene oxide with HBr to form 2-bromoethanol. This reaction was successful. An ECD (electron capture detector) gave a very good response for 2-bromoethanol due to the presence of bromine. The use of carbon disulfide as the desorbing solvent gave too large a response and masked the 2-bromoethanol. Several other solvents were tested for both their response on the ECD and their ability to desorb ethylene oxide from the charcoal. Among those tested were toluene, xylene, ethyl benzene, hexane, cyclohexane and benzene. Benzene was the only solvent tested that gave a suitable response on the ECD and a high desorption. It was found that the desorption efficiency was improved by using 1% CS₂ with the benzene. The carbon disulfide did not significantly improve the recovery with the other solvents. SKC Lot 120 was used in all tests done with activated charcoal.

(B) Physical properties (Ref. (3)(j)(ii) -(iv)):

(I) Synonyms: Oxirane; dimethylene oxide; 1,2-epoxyethane; oxane; C₂H₄O; ETO;

(II) Molecular weight: 44.06;

(III) Boiling point: 10.7°C (51.3°);

(IV) Melting point: -111°C;

(V) Description: Colorless, flammable gas;

(VI) Vapor pressure: 1095 mm. at 20°C;

(VII) Odor: Ether-like odor;

(VIII) Lower explosive limits: 3.0% (by volume);

(IX) Flash point (TOC): Below 0°F;

(X) Molecular structure: CH²—CH²;

(ii) Limit defining parameters:

(A) Detection limit of the analytical procedure. The detection limit of the analytical procedure is 12.0 picograms of ethylene oxide per injection. This is the amount of analyte which will give a peak whose height is five times the height of the baseline noise. (See backup data section (3)(i)(i).)

(B) Detection limit of the overall procedure.

(I) The detection limit of the overall procedure is 24.0 ng of ethylene oxide per sample.

(II) This is the amount of analyte spiked on the sampling device which allows recovery of an amount of analyte equivalent to the detection limit of the analytical procedure. (See backup data section (3)(i)(ii).)

(C) Reliable quantitation limit.

(I) The reliable quantitation limit is 94.0 nanograms of ethylene oxide per sample. This is the smallest amount of analyte which can be quantitated within the requirements of 75% recovery and 95% confidence limits. (See backup data section (3)(i)(ii).)

(II) It must be recognized that the reliable quantitation limit and detection limits reported in the method are based upon optimization of the instrument for the smallest possible amount of analyte. When the target concentration of an analyte is exceptionally higher than these limits, they may not be attainable at the routine operating parameters. In this case, the limits reported on analysis reports will be based on the operating parameters used during the analysis of the samples.

(D) Sensitivity.

(I) The sensitivity of the analytical procedure over a concentration range representing 0.5 to 2 times the target concentration based on the recommended air volume is 34105 area units per ug/mL. The sensitivity is determined by the slope of the calibration curve (see backup data section (3)(i)(iii)).

(II) The sensitivity will vary somewhat with the particular instrument used in the analysis.

(E) Recovery. The recovery of analyte from the collection medium must be 75% or greater. The average recovery from spiked samples over the range of 0.5 to 2 times the target concentration is 88.0% (see backup section (3)(i)(iv)). At lower concentrations the recovery appears to be nonlinear.

(F) Precision (analytical method only). The pooled coefficient of variation obtained from replicate determination of analytical standards at 0.5X, 1X and 2X the target concentration is 0.036 (see backup data section (3)(i)(v)).

(G) Precision (overall procedure).

(I) The overall procedure must provide results at the target concentration that are 25% or better at the 95% confidence level. The precision at the 95% confidence level for the 15 day storage test is plus or minus 12.9% (see backup data section (3)(i)(vi)).

(II) This includes an additional plus or minus 5% for sampling error.

(iii) Advantages.

(A) The sampling procedure is convenient.

(B) The analytical procedure is very sensitive and reproducible.

(C) Reanalysis of samples is possible.

(D) Samples are stable for at least 15 days at room temperature.

(E) Interferences are reduced by the longer GC retention time of the new derivative.

(iv) Disadvantages.

(A) Two tubes in series must be used because of possible breakthrough and migration.

(B) The precision of the sampling rate may be limited by the reproducibility of the pressure drop across the tubes. The pumps are usually calibrated for one tube only.

(C) The use of benzene as the desorption solvent increases the hazards of analysis because of the potential carcinogenic effects of benzene.

(D) After repeated injections there can be a buildup of residue formed on the electron capture detector which decreases sensitivity.

(E) Recovery from the charcoal tubes appears to be non-linear at low concentrations.

(g) Sampling procedure.

(i) Apparatus.

(A) A calibrated personal sampling pump whose flow can be determined within plus or minus 5% of the recommended flow.

(B) SKC Lot 120 Charcoal tubes: Glass tube with both ends flame sealed, 7 cm long with a 6 mm O.D. and a 4-mm I.D., containing 2 sections of coconut shell charcoal separated by a 2-mm portion of urethane foam. The adsorbing section contains 100 mg of charcoal, the backup section 50 mg. A 3-mm portion of urethane foam is placed between the outlet end of the tube and the backup section. A plug of silylated glass wool is placed in front of the adsorbing section.

(ii) Reagents.

None required.

(iii) Sampling technique.

(A) Immediately before sampling, break the ends of the charcoal tubes. All tubes must be from the same lot.

(B) Connect two tubes in series to the sampling pump with a short section of flexible tubing. A minimum amount of tubing is used to connect the two sampling tubes together. The tube closer to the pump is used as a backup. This tube should be identified as the backup tube.

(C) The tubes should be placed in a vertical position during sampling to minimize channeling.

(D) Air being sampled should not pass through any hose or tubing before entering the charcoal tubes.

(E) Seal the charcoal tubes with plastic caps immediately after sampling. Also, seal each sample with OSHA seals lengthwise.

(F) With each batch of samples, submit at least one blank tube from the same lot used for samples. This tube should be subjected to exactly the same handling as the samples (break, seal, transport) except that no air is drawn through it.

(G) Transport the samples (and corresponding paperwork) to the lab for analysis.

(H) If bulk samples are submitted for analysis, they should be transported in glass containers with Teflon-lined caps. These samples must be mailed separately from the container used for the charcoal tubes.

(iv) Breakthrough.

The breakthrough (5% breakthrough) volume for a 3.0 mg/m³ ethylene oxide sample stream at approximately 85% relative humidity, 22°C and 633 mm is 2.6 liters sampled at 0.05 liters per minute. This is equivalent to 7.8 µg of ethylene oxide. Upon saturation of the tube it appeared that the water may be displacing ethylene oxide during sampling.

(v) Desorption efficiency.

(A) The desorption efficiency, from liquid injection onto charcoal tubes, averaged 88.0% from 0.5 to 2.0 x the target concentration for a 1.0 liter air sample. At lower ranges it

appears that the desorption efficiency is nonlinear (see backup data section (3)(i)(ii)).

(B) The desorption efficiency may vary from one laboratory to another and also from one lot of charcoal to another. Thus, it is necessary to determine the desorption efficiency for a particular lot of charcoal.

(vi) Recommended air volume and sampling rate.

(A) The recommended air volume is 1.0 liter.

(B) The recommended maximum sampling rate is 0.05 Lpm.

(vii) Interferences.

(A) Ethylene glycol and Freon 12 at target concentration levels did not interfere with the collection of ethylene oxide.

(B) Suspected interferences should be listed on the sample data sheets.

(C) The relative humidity may affect the sampling procedure.

(viii) Safety precautions.

(A) Attach the sampling equipment to the employee so that it does not interfere with work performance.

(B) Wear safety glasses when breaking the ends of the sampling tubes.

(C) If possible, place the sampling tubes in a holder so the sharp end is not exposed while sampling.

(h) Analytical method.

(i) Apparatus.

(A) Gas chromatograph equipped with a linearized electron capture detector.

(B) GC column capable of separating the derivative of ethylene oxide (2-bromoethanol) from any interferences and the 1% CS₂ in benzene solvent. The column used for validation studies was: 10 ft x 1/8 inch stainless steel 20% SP-2100, 1% Carbowax 1500 on 100/120 Supelcoport.

(C) An electronic integrator or some other suitable method of measuring peak areas.

(D) Two milliliter vials with Teflon-lined caps.

(E) Gas tight syringe—500 µL or other convenient sizes for preparing standards.

(F) Microliter syringes—10 µL or other convenient sizes for diluting standards and 1 µL for sample injections.

(G) Pipets for dispensing the 1% CS₂ in benzene solvent. The Glenco 1 mL dispenser is adequate and convenient.

(H) Volumetric flasks—5 mL and other convenient sizes for preparing standards.

(I) Disposable Pasteur pipets.

(ii) Reagents.

(A) Benzene, reagent grade.

(B) Carbon disulfide, reagent grade.

(C) Ethylene oxide, 99.7% pure.

(D) Hydrobromic acid, 48% reagent grade.

(E) Sodium carbonate, anhydrous, reagent grade.

(F) Desorbing reagent, 99% Benzene/1% CS₂.

(iii) Sample preparation.

(A) The front and back sections of each sample are transferred to separate 2-mL vials.

(B) Each sample is desorbed with 1.0 mL of desorbing reagent.

(C) The vials are sealed immediately and allowed to desorb for one hour with occasional shaking.

(D) Desorbing reagent is drawn off the charcoal with a disposable pipet and put into clean 2-mL vials.

(E) One drop of HBr is added to each vial. Vials are resealed and HBr is mixed well with the desorbing reagent.

(F) About 0.15 gram of sodium carbonate is carefully added to each vial. Vials are again resealed and mixed well.

(iv) Standard preparation.

(A) Standards are prepared by injecting the pure ethylene oxide gas into the desorbing reagent.

(B) A range of standards are prepared to make a calibration curve. A concentration of 1.0 µL of ethylene oxide gas per 1 mL desorbing reagent is equivalent to 1.0 ppm air concentration (all gas volumes at 25°C and 760 mm) for the recommended 1 liter air sample. This amount is uncorrected for desorption efficiency (see backup data section (3)(i)(ii), for desorption efficiency corrections).

(C) One drop of HBr per mL of standard is added and mixed well.

(D) About 0.15 grams of sodium carbonate is carefully added for each drop of HBr (a small reaction will occur).

(v) Analysis.

(A) GC conditions.

Nitrogen flow rate—10mL/min.

Injector temperature—250°C

Detector temperature—300°C

Column temperature—100°C

Injection size—0.8 µL

Elution time—3.9 minutes

(B) Peak areas are measured by an integrator or other suitable means.

(C) The integrator results are in area units and a calibration curve is set up with concentration vs. area units.

(vi) Interferences.

(A) Any compound having the same retention time of 2-bromoethanol is a potential interference. Possible interferences should be listed on the sample data sheets.

(B) GC parameters may be changed to circumvent interferences.

(C) There are usually trace contaminants in benzene.

These contaminants, however, posed no problem of interference.

(D) Retention time data on a single column is not considered proof of chemical identity. Samples over the 1.0 ppm target level should be confirmed by GC/Mass Spec or other suitable means.

(vii) Calculations.

(A) The concentration in µg/mL for a sample is determined by comparing the area of a particular sample to the calibration curve, which has been prepared from analytical standards.

(B) The amount of analyte in each sample is corrected for desorption efficiency by use of a desorption curve.

(C) Analytical results, A, from the two tubes that compose a particular air sample are added together.

(D) The concentration for a sample is calculated by the following equation:

$$\text{ETO, mg/m}^3 = \frac{\text{AXB}}{\text{C}}$$

where:

A = $\mu\text{g/mL}$

B = desorption volume in milliliters

C = air volume in liters.

(E) To convert mg/m^3 to parts per million (ppm) the following relationship is used:

$$\text{ETO, ppm} = \frac{\text{mg/m}^3 \times 24.45}{44.05}$$

where:

mg/m^3 = results from 3.7.4

24.45 = molar volume at 25°C and 760mm Hg

44.05 = air volume in liters.

(viii) Safety precaution

(A) Ethylene oxide and benzene are potential carcinogens and care must be exercised when working with these compounds.

(B) All work done with the solvents (preparation of standards, desorption of samples, etc.) should be done in a hood.

(C) Avoid any skin contact with all of the solvents.

(D) Wear safety glasses at all times.

(E) Avoid skin contact with HBr because it is highly toxic and a strong irritant to eyes and skin.

(i) Backup data.

(i) Detection limit data.

The detection limit was determined by injecting 0.8 μL of a 0.015 $\mu\text{g/mL}$ standard of ethylene oxide into 1% CS₂ in benzene. The detection limit of the analytical procedure is taken to be 1.20×10^{-5} μg per injection. This is equivalent to 8.3 ppb (0.015 mg/m^3) for the recommended air volume.

(ii) Desorption efficiency. Ethylene oxide was spiked into charcoal tubes and the following recovery data was obtained:

Amount spiked (μg)	Amount recovered (μg)	Percent recovery
4.5	4.32	96.0
3.0	2.61	87.0
2.25	2.025	90.0
1.5	1.365	91.0
1.5	1.38	92.0
.75	6525	87.0
.375	.315	84.0
.375	.312	83.2
.1875	.151	80.5
.094	.070	74.5

Note: At lower amounts the recovery appears to be nonlinear.

(iii) Sensitivity data. The following data was used to determine the calibration curve:

Injection	0.5 x .75 $\mu\text{g/mL}$	1 x 1.5 $\mu\text{g/mL}$	2 x 3.0 $\mu\text{g/mL}$
1.....	30904	59567	111778
2.....	30987	62914	106016
3.....	32555	58578	106122
4.....	32242	57173	109716
X.....	31672	59558	108408

Slope= 34.105.

(iv) Recovery. The recovery was determined by spiking ethylene oxide onto lot 120 charcoal tubes and desorbing with 1% CS₂ in Benzene. Recoveries were done at 0.5, 1.0, and 2.0 X the target concentration (1 ppm) for the recommended air volume.

Percent Recovery

Sample	0.5x	1.0x	2.0x
1.....	88.7	95.0	91.7
2.....	83.8	95.0	87.3
3.....	84.2	91.0	86.0
4.....	88.0	91.0	83.0
5.....	88.0	86.0	85.0
X.....	86.5	90.5	87.0

Weighted average= 88.2

(v) Precision of the analytical procedure. The following data was used to determine the precision of the analytical method:

Concentration	0.5 x .75 $\mu\text{g/mL}$	1 x 1.5 $\mu\text{g/mL}$	2 x 3.0 $\mu\text{g/mL}$
Injection	.7421	1.4899	3.1184
	.7441	1.5826	3.0447
	.7831	1.4628	2.9149
	.7753	1.4244	2.9185
	.7612	1.4899	2.9991
Average Standard Deviation	.0211	.0674	.0998
CV.....	.0277	.0452	.0333

$$\text{CV} = \frac{3(.0277)^2 + 3(.0452)^2 + 3(.0333)^2}{3 + 3 + 3}$$

(vi) Storage data. Samples were generated at 1.5 mg/m^3 ethylene oxide at 85% relative humidity, 22°C and 633 mm. All samples were taken for 20 minutes at 0.05 Lpm. Six samples were analyzed as soon as possible and fifteen samples were stored at refrigerated temperature (5°C) and fifteen samples were stored at ambient temperature (23°C). These stored samples were analyzed over a period of nineteen days.

Percent Recovery

Day analyzed	Refrigerated	Ambient
1.....	87.0	87.0
1.....	93.0	93.0
1.....	94.0	94.0
1.....	92.0	92.0
4.....	92.0	91.0
4.....	93.0	88.0
4.....	91.0	89.0
6.....	92.0	—
6.....	92.0	—
8.....	—	92.0
8.....	—	86.0
10.....	91.7	—
10.....	95.5	—
10.....	95.7	—
11.....	—	90.0
11.....	—	82.0

Day analyzed	Refrigerated	Ambient
13.	78.0	—
13.	81.4	—
13.	82.4	—
14.	—	78.5
14.	—	72.1
18.	66.0	—
18.	68.0	—
19.	—	64.0
19.	—	77.0

(vii) Breakthrough data.

(A) Breakthrough studies were done at 2 ppm (3.6 mg/m³) at approximately 85% relative humidity at 22°C (ambient temperature). Two charcoal tubes were used in series. The backup tube was changed every 10 minutes and analyzed for breakthrough. The flow rate was 0.050 Lpm.

Tube No.	Time (Minutes)	Percent breakthrough
1.	10	(¹)
2.	20	(¹)
3.	30	(¹)
4.	40	1.23
5.	50	3.46
6.	60	18.71
7.	70	39.2
8.	80	53.3
9.	90	72.0
10.	100	96.0
11.	110	113.0
12.	120	133.9

¹None.

(B) The 5% breakthrough volume was reached when 2.6 liters of test atmosphere were drawn through the charcoal tubes.

(j) References.

(i) "NIOSH Manual of Analytical Methods," 2nd ed. NIOSH: Cincinnati, 1977; Method S 286.

(ii) "IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man." International Agency for Research on Cancer: Lyon, 1976; Vol. II, p. 157.

(iii) Sax., N.I. "Dangerous Properties of Industrial Materials," 4th ed.; Van Nostrand Reinhold Company, New York, 1975; p. 741.

(iv) "The Condensed Chemical Dictionary," 9th ed.; Hawley, G.G., ed.; Van Nostrand Reinhold Company, New York, 1977; p. 361.

(4) Summary of other sampling procedures. OSHA believes that several other types of monitoring equipment and techniques exist for monitoring time-weighted averages. Considerable research and method development is currently being performed, which will lead to improvements and a wider variety of monitoring techniques. A combination of monitoring procedures can be used. There probably is no one best method for monitoring personal exposure to ethylene oxide in all cases. There are advantages, disadvantages, and limitations to each method. The method of choice will depend on the need and requirements. Some commonly used methods include the use of charcoal tubes, passive dosime-

ters, Tedlar gas sampling bags, detector tubes, photoionization detection units, infrared detection units and gas chromatographs. A number of these methods are described below.

(a) Charcoal tube sampling procedures.

(i) Qazi-Ketcham method (Ex-11-133)—This method consists of collecting EtO on Columbia JXC activated carbon, desorbing the EtO with carbon disulfide and analyzing by gas chromatography with flame ionization detection. Union Carbide has recently updated and revalidated this monitoring procedure. This method is capable of determining both eight-hour time-weighted average exposures and short-term exposures. The method was validated to 0.5 ppm. Like other charcoal collecting procedures, the method requires considerable analytical expertise.

(ii) ASTM-proposed method—The Ethylene Oxide Industry Council (EOIC) has contracted with Clayton Environmental Consultants, Inc. to conduct a collaborative study for the proposed method. The ASTM-Proposed method is similar to the method published by Qazi and Ketcham in the November 1977 American Industrial Hygiene Association Journal, and to the method of Pilney and Coyne, presented at the 1979 American Industrial Hygiene Conference. After the air to be sampled is drawn through an activated charcoal tube, the ethylene oxide is desorbed from the tube using carbon disulfide and is quantitated by gas chromatography utilizing a flame ionization detector. The ASTM-proposed method specifies a large two-section charcoal tube, shipment in dry ice, storage at less than -5°C, and analysis within three weeks to prevent migration and sample loss. Two types of charcoal tubes are being tested—Pittsburgh Coconut-Based (PCB) and Columbia JXC charcoal. This collaborative study will give an indication of the inter- and intralaboratory precision and accuracy of the ASTM/proposed method. Several laboratories have considerable expertise using the Qazi-Ketcham and Dow methods.

(b) Passive monitors—Ethylene oxide diffuses into the monitor and is collected in the sampling media. The DuPont Pro-Tek badge collects EtO in an absorbing solution, which is analyzed colorimetrically to determine the amount of EtO present. The 3M 350 badge collects the EtO on chemically treated charcoal. Other passive monitors are currently being developed and tested. Both 3M and DuPont have submitted data indicating their dosimeters meet the precision and accuracy requirements of the proposed ethylene oxide standard. Both presented laboratory validation data to 0.2 ppm (Exs. 11-65, 4-20, 108, 109, 130).

(c) Tedlar gas sampling bags—samples are collected by drawing a known volume of air into a Tedlar gas sampling bag. The ethylene oxide concentration is often determined on-site using a portable gas chromatograph or portable infrared spectrometer.

(d) Detector tubes—A known volume of air is drawn through a detector tube using a small hand pump. The concentration of EtO is related to the length of stain developed in the tube. Detector tubes are economical, easy to use, and give an immediate readout. Unfortunately, partly because they are nonspecific, their accuracy is often questionable. Since the sample is taken over a short period of time, they may be useful for determining the source of leaks.

(e) Direct reading instruments:

(i) There are numerous types of direct reading instruments, each having its own strengths and weaknesses (Exs. 135B, 135C, 107, 11-78, 11-153). Many are relatively new, offering greater sensitivity and specificity. Popular ethylene oxide direct reading instruments include infrared detection units, photoionization detection units, and gas chromatographs.

(ii) Portable infrared analyzers provide an immediate, continuous indication of a concentration value; making them particularly useful for locating high concentration pockets, in leak detection and in ambient air monitoring. In infrared detection units, the amount of infrared light absorbed by the gas being analyzed at selected infrared wavelengths is related to the concentration of a particular component. Various models have either fixed or variable infrared filters, differing cell pathlengths, and microcomputer controls for greater sensitivity, automation, and interference elimination.

(iii) A fairly recent detection system is photoionization detection. The molecules are ionized by high energy ultraviolet light. The resulting current is measured. Since different substances have different ionization potentials, other organic compounds may be ionized. The lower the lamp energy, the better the selectivity. As a continuous monitor, photoionization detection can be useful for locating high concentration pockets, in leak detection, and continuous ambient air monitoring. Both portable and stationary gas chromatographs are available with various types of detectors, including photoionization detectors. A gas chromatograph with a photoionization detector retains the photoionization sensitivity, but minimizes or eliminates interferences. For several GC/PID units, the sensitivity is in the 0.1-0.2 ppm EtO range. The GC/PID with microprocessors can sample up to 20 sample points sequentially, calculate and record data, and activate alarms or ventilation systems. Many are quite flexible and can be configured to meet the specific analysis needs for the workplace.

(iv) **DuPont presented their laboratory validation data of the accuracy of the Qazi-Ketcham charcoal tube, the PCB charcoal tube, Miran 103 IR analyzer, 3M #3550 monitor and the DuPont C-70 badge. Quoting Elbert V. Kring:**

(v) We also believe that OSHA's proposed accuracy in this standard is appropriate. At plus or minus 25 percent at one part per million, and plus or minus 35 percent below that. And, our data indicates there's only one monitoring method, right now, that we've tested thoroughly, that meets that accuracy requirements. That is the DuPont Pro-Tek badge***. We also believe that this kind of data should be confirmed by another independent laboratory, using the same type dynamic chamber testing (Tr. 1470).

Additional data by an independent laboratory following their exact protocol was not submitted. However, information was submitted on comparisons and precision and accuracy of those monitoring procedures which indicate far better precision and accuracy of those monitoring procedures than that obtained by DuPont (Ex. 4-20, 130, 11-68, 11-133, 130, 135A)

(vi) The accuracy of any method depends to a large degree upon the skills and experience of those who not only collect the samples but also those who analyze the samples. Even for methods that are collaboratively tested, some labo-

ratories are closer to the true values than others. Some laboratories may meet the precision and accuracy requirements of the method; others may consistently far exceed them for the same method.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-62-07389, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-07389, filed 11/30/87.]

WAC 296-62-074 Cadmium.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-074, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07401 Scope. This standard applies to all occupational exposures to cadmium and cadmium compounds, in all forms, and in all industries covered by the Washington Industrial Safety and Health Act, except the construction-related industries, which are covered under WAC 296-155-174.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07401, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07403 Definitions. (1) Action level (AL) is defined as an airborne concentration of cadmium of 2.5 micrograms per cubic meter of air (2.5 µg/m³), calculated as an 8-hour time-weighted average (TWA).

(2) Authorized person means any person authorized by the employer and required by work duties to be present in regulated areas or any person authorized by the WISH Act or regulations issued under it to be in regulated areas.

(3) Director means the director of the department of labor and industries, or authorized representatives.

(4) Employee exposure and similar language referring to the air cadmium level to which an employee is exposed means the exposure to airborne cadmium that would occur if the employee were not using respiratory protective equipment.

(5) Final medical determination is the written medical opinion of the employee's health status by the examining physician under WAC 296-62-07423 (3) through (12) or, if multiple physician review under WAC 296-62-07423(13) or the alternative physician determination under WAC 296-62-07423(14) is invoked, it is the final, written medical finding, recommendation or determination that emerges from that process.

(6) High-efficiency particulate air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

(7) Regulated area means an area demarcated by the employer where an employee's exposure to airborne concentrations of cadmium exceeds, or can reasonably be expected to exceed the permissible exposure limit (PEL).

[Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-62-07403, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07403, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07405 Permissible exposure limit (PEL). The employer shall assure that no employee is exposed to an airborne concentration of cadmium in excess of five micrograms per cubic meter of air (5 µg/m³), calculated as an 8-hour time-weighted average exposure (TWA).

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07405, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07407 Exposure monitoring. (1) General.

(a) Each employer who has a workplace or work operation covered by this section shall determine if any employee may be exposed to cadmium at or above the action level.

(b) Determinations of employee exposure shall be made from breathing zone air samples that reflect the monitored employee's regular, daily 8-hour TWA exposure to cadmium.

(c) 8-hour TWA exposures shall be determined for each employee on the basis of one or more personal breathing zone air samples reflecting full shift exposure on each shift, for each job classification, in each work area. Where several employees perform the same job tasks, in the same job classification, on the same shift, in the same work area, and the length, duration, and level of cadmium exposures are similar, an employer may sample a representative fraction of the employees instead of all employees in order to meet this requirement. In representative sampling, the employer shall sample the employee(s) expected to have the highest cadmium exposures.

(2) Specific.

(a) Initial monitoring. Except as provided for in (b) and (c) of this subsection, the employer shall monitor employee exposures and shall base initial determinations on the monitoring results.

(b) Where the employer has monitored after September 14, 1991, under conditions that in all important aspects closely resemble those currently prevailing and where that monitoring satisfies all other requirements of this section, including the accuracy and confidence levels of subsection (6) of this section, the employer may rely on such earlier monitoring results to satisfy the requirements of WAC 296-62-07427 (2)(a).

(c) Where the employer has objective data, as defined in WAC 296-62-07427(2), demonstrating that employee exposure to cadmium will not exceed the action level under the expected conditions of processing, use, or handling, the employer may rely upon such data instead of implementing initial monitoring.

(3) Monitoring frequency (periodic monitoring).

(a) If the initial monitoring or periodic monitoring reveals employee exposures to be at or above the action level, the employer shall monitor at a frequency and pattern needed to represent the levels of exposure of employees and where exposures are above the PEL to assure the adequacy of respiratory selection and the effectiveness of engineering and work practice controls. However, such exposure monitoring shall be performed at least every six months. The employer, at a minimum, shall continue these semiannual measurements unless and until the conditions set out in (b) of this subsection are met.

(b) If the initial monitoring or the periodic monitoring indicates that employee exposures are below the action level and that result is confirmed by the results of another monitoring taken at least seven days later, the employer may discontinue the monitoring for those employees whose exposures are represented by such monitoring.

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(4) Additional monitoring. The employer also shall institute the exposure monitoring required under (2)(a) and (3) of this section whenever there has been a change in the raw materials, equipment, personnel, work practices, or finished products that may result in additional employees being exposed to cadmium at or above the action level or in employees already exposed to cadmium at or above the action level being exposed above the PEL, or whenever the employer has any reason to suspect that any other change might result in such further exposure.

(5) Employee notification of monitoring results.

(a) Within fifteen working days after the receipt of the results of any monitoring performed under this section, the employer shall notify each affected employee individually in writing of the results. In addition, within the same time period the employer shall post the results of the exposure monitoring in an appropriate location that is accessible to all affected employees.

(b) Wherever monitoring results indicate that employee exposure exceeds the PEL, the employer shall include in the written notice a statement that the PEL has been exceeded and a description of the corrective action being taken by the employer to reduce employee exposure to or below the PEL.

(6) Accuracy of measurement. The employer shall use a method of monitoring and analysis that has an accuracy of not less than plus or minus twenty-five percent, with a confidence level of ninety-five percent, for airborne concentrations of cadmium at or above the action level, the permissible exposure limit (PEL), and the separate engineering control air limit (SECAL).

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07407, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07409 Regulated areas. (1) Establishment. The employer shall establish a regulated area wherever an employee's exposure to airborne concentrations of cadmium is, or can reasonably be expected to be in excess of the permissible exposure limit (PEL).

(2) Demarcation. Regulated areas shall be demarcated from the rest of the workplace in any manner that adequately establishes and alerts employees of the boundaries of the regulated area.

(3) Access. Access to regulated areas shall be limited to authorized persons.

(4) Provision of respirators. Each person entering a regulated area shall be supplied with and required to use a respirator, selected in accordance with WAC 296-62-07413(2).

(5) Prohibited activities. The employer shall assure that employees do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas, carry the products associated with these activities into regulated areas, or store such products in those areas.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07409, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07411 Methods of compliance. (1) Compliance hierarchy.

(a) Except as specified in (b), (c), and (d) of this subsection, the employer shall implement engineering and work practice controls to reduce and maintain employee exposure

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to cadmium at or below the PEL, except to the extent that the employer can demonstrate that such controls are not feasible.

(b) Except as specified in (c) and (d) of this subsection, in industries where a separate engineering control air limit (SECAL) has been specified for particular processes (Table 1 of this subsection), the employer shall implement engineering and work practice controls to reduce and maintain employee exposure at or below the SECAL, except to the extent that the employer can demonstrate that such controls are not feasible.

Table 1.—Separate Engineering Control Airborne Limits (SECALs) for Processes in Selected Industries

Industry	Process	SECAL ($\mu\text{g}/\text{m}^3$)
Nickel cadmium battery	Plate making, plate preparation	50
	All other processes	15
Zinc/Cadmium refining*	Cadmium refining, casting, melting, oxide production, sinter plant	50
	Calcine, crushing, milling, blending	50
Pigment manufacture	All other processes	15
	Cadmium oxide charging, crushing, drying, blending	50
Stabilizers*	Sinter plant, blast furnace, bag-house, yard area	50
Lead smelting*	Mechanical plating	15

* Processes in these industries that are not specified in this table must achieve the PEL using engineering controls and work practices as required in (a) of this subsection.

(c) The requirement to implement engineering and work practice controls to achieve the PEL or, where applicable, the SECAL does not apply where the employer demonstrates the following:

(i) The employee is only intermittently exposed; and

(ii) The employee is not exposed above the PEL on thirty or more days per year (twelve consecutive months).

(d) Wherever engineering and work practice controls are required and are not sufficient to reduce employee exposure to or below the PEL or, where applicable, the SECAL, the employer nonetheless shall implement such controls to reduce exposures to the lowest levels achievable. The employer shall supplement such controls with respiratory protection that complies with the requirements of WAC 296-62-07413 and the PEL.

(e) The employer shall not use employee rotation as a method of compliance.

(2) Compliance program.

(a) Where the PEL is exceeded, the employer shall establish and implement a written compliance program to reduce employee exposure to or below the PEL by means of engineering and work practice controls, as required by subsection (1) of this section. To the extent that engineering and work practice controls cannot reduce exposures to or below the PEL, the employer shall include in the written compliance program the use of appropriate respiratory protection to achieve compliance with the PEL.

(b) Written compliance programs shall include at least the following:

(i) A description of each operation in which cadmium is emitted; e.g., machinery used, material processed, controls in

place, crew size, employee job responsibilities, operating procedures, and maintenance practices;

(ii) A description of the specific means that will be employed to achieve compliance, including engineering plans and studies used to determine methods selected for controlling exposure to cadmium, as well as, where necessary, the use of appropriate respiratory protection to achieve the PEL;

(iii) A report of the technology considered in meeting the PEL;

(iv) Air monitoring data that document the sources of cadmium emissions;

(v) A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.;

(vi) A work practice program that includes items required under WAC 296-62-07415, 296-62-07417, and 296-62-07419;

(vii) A written plan for emergency situations, as specified in WAC 296-62-07415; and

(viii) Other relevant information.

(c) The written compliance programs shall be reviewed and updated at least annually, or more often if necessary, to reflect significant changes in the employer's compliance status.

(d) Written compliance programs shall be provided upon request for examination and copying to affected employees, designated employee representatives, and the director.

(3) Mechanical ventilation.

(a) When ventilation is used to control exposure, measurements that demonstrate the effectiveness of the system in controlling exposure, such as capture velocity, duct velocity, or static pressure shall be made as necessary to maintain its effectiveness.

(b) Measurements of the system's effectiveness in controlling exposure shall be made as necessary within five working days of any change in production, process, or control that might result in a significant increase in employee exposure to cadmium.

(c) Recirculation of air. If air from exhaust ventilation is recirculated into the workplace, the system shall have a high efficiency filter and be monitored to assure effectiveness.

(d) Procedures shall be developed and implemented to minimize employee exposure to cadmium when maintenance of ventilation systems and changing of filters is being conducted.

[Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-62-07411, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07411, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07413 Respirator protection. (1) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(a) Periods necessary to install or implement feasible engineering and work-practice controls when employee exposure levels exceed the PEL;

(b) Maintenance and repair activities, and brief or intermittent operations, where employee exposures exceed the

PEL and engineering and work-practice controls are not feasible or are not required;

(c) Activities in regulated areas as specified in WAC 296-62-07409;

(d) Work operations for which the employer has implemented all feasible engineering and work-practice controls and such controls are not sufficient to reduce employee exposures to or below the PEL;

(e) Work operations for which an employee who is exposed to cadmium at or above the action level, and the employee requests a respirator;

(f) Work operations for which an employee is exposed above the PEL and engineering controls are not required by WAC 296-62-07411 (1)(b); and

(g) Emergencies.

(2) Respirator program.

(a) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(b) No employees must use a respirator if, based on their recent medical examination, the examining physician determines that they will be unable to continue to function normally while using a respirator. If the physician determines that the employee must be limited in, or removed from, their current job because of their inability to use a respirator, the limitation or removal must be in accordance with WAC 296-62-07423 (11) and (12).

(c) If an employee has breathing difficulty during fit testing or respirator use, the employer must provide the employee with a medical examination as required by WAC 296-62-07423 (6)(b) to determine if the employee can use a respirator while performing the required duties.

(3) Respirator selection.

(a) The employer must select the appropriate respirator from Table 2 of this section.

Table 2.—Respiratory Protection for Cadmium

Airborne concentration or condition of use ^a	Required respirator type ^b
10 x or less	A half mask, air-purifying respirator equipped with a HEPA ^c filter ^d .
25 x or less	A powered air-purifying respirator ("PAPR") with a loose-fitting hood or helmet equipped with a HEPA filter, or a supplied-air respirator with a loose-fitting hood or helmet facepiece operated in the continuous flow mode.

Table 2.—Respiratory Protection for Cadmium
50 x or less

A full facepiece air-purifying respirator equipped with a HEPA filter, or a powered air-purifying respirator with a tight-fitting half mask equipped with a HEPA filter, or a supplied air respirator with a tight-fitting half mask operated in the continuous flow mode.

250 x or less

A powered air-purifying respirator with a tight-fitting full facepiece equipped with a HEPA filter, or a supplied-air respirator with a tight-fitting full facepiece operated in the continuous flow mode.

1000 x or less

A supplied-air respirator with half mask or full facepiece operated in the pressure demand or other positive pressure mode.

>1000 x or unknown concentrations

A self-contained breathing apparatus with a full facepiece operated in the pressure demand or other positive pressure mode, or a supplied-air respirator with a full facepiece operated in the pressure demand or other positive pressure mode and equipped with an auxiliary escape type self-contained breathing apparatus operated in the pressure demand mode.

Fire fighting

A self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

^a Concentrations expressed as multiple of the PEL.

^b Respirators assigned for higher environmental concentrations may be used at lower exposure levels. Quantitative fit testing is required for all tight-fitting air purifying respirators where airborne concentration of cadmium exceeds 10 times the TWA PEL ($10 \times 5 \mu\text{g}/\text{m}^3 = 50 \mu\text{g}/\text{m}^3$). A full facepiece respirator is required when eye irritation is experienced.

^c HEPA means High Efficiency Particulate Air.

^d Fit testing, qualitative or quantitative, is required.

SOURCE: Respiratory Decision Logic, NIOSH, 1987

(b) The employer must provide an employee with a powered, air-purifying respirator (PAPR) instead of a negative-pressure respirator when an employee who is entitled to a respirator chooses to use this type of respirator and such a respirator provides adequate protection to the employee.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07413, filed 5/4/99, effective 9/1/99. Statutory Authority:

Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-62-07413, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07413, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07415 Emergency situations. The employer shall develop and implement a written plan for dealing with emergency situations involving substantial releases of airborne cadmium. The plan shall include provisions for the use of appropriate respirators and personal protective equipment. In addition, employees not essential to correcting the emergency situation shall be restricted from the area and normal operations halted in that area until the emergency is abated.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07415, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07417 Protective work clothing and equipment. (1) Provision and use. If an employee is exposed to airborne cadmium above the PEL or where skin or eye irritation is associated with cadmium exposure at any level, the employer shall provide at no cost to the employee, and assure that the employee uses, appropriate protective work clothing and equipment that prevents contamination of the employee and the employee's garments. Protective work clothing and equipment includes, but is not limited to:

- (a) Coveralls or similar full-body work clothing;
- (b) Gloves, head coverings, and boots or foot coverings;

and

- (c) Face shields, vented goggles, or other appropriate protective equipment that complies with chapter 296-24 WAC, Part A-2.

- (2) Removal and storage.

- (a) The employer shall assure that employees remove all protective clothing and equipment contaminated with cadmium at the completion of the work shift and do so only in change rooms provided in accordance with WAC 296-62-07419(1).

- (b) The employer shall assure that no employee takes cadmium-contaminated protective clothing or equipment from the workplace, except for employees authorized to do so for purposes of laundering, cleaning, maintaining, or disposing of cadmium contaminated protective clothing and equipment at an appropriate location or facility away from the workplace.

- (c) The employer shall assure that contaminated protective clothing and equipment, when removed for laundering, cleaning, maintenance, or disposal, is placed and stored in sealed, impermeable bags or other closed, impermeable containers that are designed to prevent dispersion of cadmium dust.

- (d) The employer shall assure that bags or containers of contaminated protective clothing and equipment that are to be taken out of the change rooms or the workplace for laundering, cleaning, maintenance, or disposal shall bear labels in accordance with WAC 296-62-07425(3).

- (3) Cleaning, replacement, and disposal.

- (a) The employer shall provide the protective clothing and equipment required by subsection (1) of this section in a clean and dry condition as often as necessary to maintain its effectiveness, but in any event at least weekly. The employer

is responsible for cleaning and laundering the protective clothing and equipment required by this paragraph to maintain its effectiveness and is also responsible for disposing of such clothing and equipment.

- (b) The employer also is responsible for repairing or replacing required protective clothing and equipment as needed to maintain its effectiveness. When rips or tears are detected while an employee is working they shall be immediately mended, or the worksuit shall be immediately replaced.

- (c) The employer shall prohibit the removal of cadmium from protective clothing and equipment by blowing, shaking, or any other means that disperses cadmium into the air.

- (d) The employer shall assure that any laundering of contaminated clothing or cleaning of contaminated equipment in the workplace is done in a manner that prevents the release of airborne cadmium in excess of the permissible exposure limit prescribed in WAC 296-62-07405.

- (e) The employer shall inform any person who launders or cleans protective clothing or equipment contaminated with cadmium of the potentially harmful effects of exposure to cadmium and that the clothing and equipment should be laundered or cleaned in a manner to effectively prevent the release of airborne cadmium in excess of the PEL.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-62-07417, filed 9/30/94, effective 11/20/94; 93-21-075 (Order 93-06), § 296-62-07417, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07417, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07419 Hygiene areas and practices. (1) General. For employees whose airborne exposure to cadmium is above the PEL, the employer shall provide clean change rooms, handwashing facilities, showers, and lunchroom facilities that comply with WAC 296-24-120.

- (2) Change rooms. The employer shall assure that change rooms are equipped with separate storage facilities for street clothes and for protective clothing and equipment, which are designed to prevent dispersion of cadmium and contamination of the employee's street clothes.

- (3) Showers and handwashing facilities.

- (a) The employer shall assure that employees who are exposed to cadmium above the PEL shower during the end of the work shift.

- (b) The employer shall assure that employees whose airborne exposure to cadmium is above the PEL wash their hands and faces prior to eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics.

- (4) Lunchroom facilities.

- (a) The employer shall assure that the lunchroom facilities are readily accessible to employees, that tables for eating are maintained free of cadmium, and that no employee in a lunchroom facility is exposed at any time to cadmium at or above a concentration of 2.5 µg/m³.

- (b) The employer shall assure that employees do not enter lunchroom facilities with protective work clothing or equipment unless surface cadmium has been removed from the clothing and equipment by HEPA vacuuming or some other method that removes cadmium dust without dispersing it.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07419, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07421 Housekeeping. (1) All surfaces shall be maintained as free as practicable of accumulations of cadmium.

(2) All spills and sudden releases of material containing cadmium shall be cleaned up as soon as possible.

(3) Surfaces contaminated with cadmium shall, wherever possible, be cleaned by vacuuming or other methods that minimize the likelihood of cadmium becoming airborne.

(4) HEPA-filtered vacuuming equipment or equally effective filtration methods shall be used for vacuuming. The equipment shall be used and emptied in a manner that minimizes the reentry of cadmium into the workplace.

(5) Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other methods that minimize the likelihood of cadmium becoming airborne have been tried and found not to be effective.

(6) Compressed air shall not be used to remove cadmium from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the dust cloud created by the compressed air.

(7) Waste, scrap, debris, bags, containers, personal protective equipment, and clothing contaminated with cadmium and consigned for disposal shall be collected and disposed of in sealed impermeable bags or other closed, impermeable containers. These bags and containers shall be labeled in accordance with WAC 296-62-07425(2).

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07421, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07423 Medical surveillance. (1) General.

(a) Scope.

(i) Currently exposed. The employer shall institute a medical surveillance program for all employees who are or may be exposed to cadmium at or above the action level unless the employer demonstrates that the employee is not, and will not be, exposed at or above the action level on thirty or more days per year (twelve consecutive months); and

(ii) Previously exposed. The employer shall also institute a medical surveillance program for all employees who prior to the effective date of this section might previously have been exposed to cadmium at or above the action level by the employer, unless the employer demonstrates that the employee did not prior to the effective date of this section work for the employer in jobs with exposure to cadmium for an aggregated total of more than sixty months.

(b) To determine an employee's fitness for using a respirator, the employer shall provide the limited medical examination specified in subsection (6) of this section.

(c) The employer shall assure that all medical examinations and procedures required by this standard are performed by or under the supervision of a licensed physician, who has read and is familiar with the health effects WAC 296-62-07441, Appendix A, the regulatory text of this section, the protocol for sample handling and laboratory selection in WAC 296-62-07451, Appendix F and the questionnaire of WAC 296-62-07447, Appendix D. These examinations and procedures shall be provided without cost to the employee and at a time and place that is reasonable and convenient to employees.

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(d) The employer shall assure that the collecting and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (β_2 -M) taken from employees under this section is done in a manner that assures their reliability and that analysis of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (β_2 -M) taken from employees under this section is performed in laboratories with demonstrated proficiency for that particular analyte. (See WAC 296-62-07451, Appendix F.)

(2) Initial examination.

(a) The employer shall provide an initial (preplacement) examination to all employees covered by the medical surveillance program required in subsection (1)(a) of this section. The examination shall be provided to those employees within thirty days after initial assignment to a job with exposure to cadmium or no later than ninety days after the effective date of this section, whichever date is later.

(b) The initial (preplacement) medical examination shall include:

(i) A detailed medical and work history, with emphasis on: Past, present, and anticipated future exposure to cadmium; any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculo-skeletal system dysfunction; current usage of medication with potential nephrotoxic side-effects; and smoking history and current status; and

(ii) Biological monitoring that includes the following tests:

(A) Cadmium in urine (CdU), standardized to grams of creatinine (g/Cr);

(B) Beta-2 microglobulin in urine (β_2 -M), standardized to grams of creatinine (g/Cr), with pH specified, as described in WAC 296-62-07451, Appendix F; and

(C) Cadmium in blood (CdB), standardized to liters of whole blood (lwb).

(c) Recent examination: An initial examination is not required to be provided if adequate records show that the employee has been examined in accordance with the requirements of (b) of this subsection within the past twelve months. In that case, such records shall be maintained as part of the employee's medical record and the prior exam shall be treated as if it were an initial examination for the purposes of subsections (3) and (4) of this section.

(3) Actions triggered by initial biological monitoring:

(a) If the results of the initial biological monitoring tests show the employee's CdU level to be at or below 3 μ g/g Cr, β_2 -M level to be at or below 300 μ g/g Cr and CdB level to be at or below 5 μ g/lwb, then:

(i) For currently exposed employees, who are subject to medical surveillance under subsection (1)(a)(i) of this section, the employer shall provide the minimum level of periodic medical surveillance in accordance with the requirements in subsection (4)(a) of this section; and

(ii) For previously exposed employees, who are subject to medical surveillance under subsection (1)(a)(ii) of this section, the employer shall provide biological monitoring for CdU, β_2 -M, and CdB one year after the initial biological

monitoring and then the employer shall comply with the requirements of subsection (4)(e) of this section.

(b) For all employees who are subject to medical surveillance under subsection (1)(a) of this section, if the results of the initial biological monitoring tests show the level of CdU to exceed 3 µg/g Cr, the level of β₂-M to exceed 300 µg/g Cr, or the level of CdB to exceed 5 µg/lwb, the employer shall:

(i) Within two weeks after receipt of biological monitoring results, reassess the employee's occupational exposure to cadmium as follows:

(A) Reassess the employee's work practices and personal hygiene;

(B) Reevaluate the employee's respirator use, if any, and the respirator program;

(C) Review the hygiene facilities;

(D) Reevaluate the maintenance and effectiveness of the relevant engineering controls;

(E) Assess the employee's smoking history and status;

(ii) Within thirty days after the exposure reassessment, specified in (b)(i) of this subsection, take reasonable steps to correct any deficiencies found in the reassessment that may be responsible for the employee's excess exposure to cadmium; and,

(iii) Within ninety days after receipt of biological monitoring results, provide a full medical examination to the employee in accordance with the requirements of WAC 296-62-07423 (4)(b). After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the employee. If the physician determines that medical removal is not necessary, then until the employee's CdU level falls to or below 3 µg/g Cr, β₂-M level falls to or below 300 µg/g Cr and CdB level falls to or below 5 µg/lwb, the employer shall:

(A) Provide biological monitoring in accordance with subsection (2)(b)(ii) of this section on a semiannual basis; and

(B) Provide annual medical examinations in accordance with subsection (4)(b) of this section.

(c) For all employees who are subject to medical surveillance under subsection (1)(a) of this section, if the results of the initial biological monitoring tests show the level of CdU to be in excess of 15 µg/g Cr, or the level of CdB to be in excess of 15 µg/lwb, or the level of β₂-M to be in excess of 1,500 µg/g Cr, the employer shall comply with the requirements of (b)(i) and (ii) of this subsection. Within ninety days after receipt of biological monitoring results, the employer shall provide a full medical examination to the employee in accordance with the requirements of subsection (4)(b) of this section. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the employee. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 15 µg/g Cr; or CdB exceeds 15 µg/lwb; or β₂-M exceeds 1500 µg/g Cr, and in addition CdU exceeds 3 µg/g Cr or CdB exceeds 5 µg/liter of whole blood, then the physician shall medically remove the employee from exposure to cadmium at or above the action level. If the second set of biological monitoring results

obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the employee is not required to be removed by the mandatory provisions of this section. If the employee is not required to be removed by the mandatory provisions of this section or by the physician's determination, then until the employee's CdU level falls to or below 3 µg/g Cr, β₂-M level falls to or below 300 µg/g Cr and CdB level falls to or below 5 µg/lwb, the employer shall:

(i) Periodically reassess the employee's occupational exposure to cadmium;

(ii) Provide biological monitoring in accordance with subsection (2)(b)(ii) of this section on a quarterly basis; and

(iii) Provide semiannual medical examinations in accordance with subsection (4)(b) of this section.

(d) For all employees to whom medical surveillance is provided, beginning on January 1, 1999, and in lieu of (a) through (c) of this subsection:

(i) If the results of the initial biological monitoring tests show the employee's CdU level to be at or below 3 µg/g Cr, β₂-M level to be at or below 300 µg/g Cr and CdB level to be at or below 5 µg/lwb, then for currently exposed employees, the employer shall comply with the requirements of (a)(i) of this subsection and for previously exposed employees, the employer shall comply with the requirements of (a)(ii) of this subsection;

(ii) If the results of the initial biological monitoring tests show the level of CdU to exceed 3 µg/g Cr, the level of β₂-M to exceed 300 µg/g Cr, or the level of CdB to exceed 5 µg/lwb, the employer shall comply with the requirements of (b)(i) through (iii) of this subsection; and

(iii) If the results of the initial biological monitoring tests show the level of CdU to be in excess of 7 µg/g Cr, or the level of CdB to be in excess of 10 µg/lwb, or the level of β₂-M to be in excess of 750 µg/g Cr, the employer shall: Comply with the requirements of (b)(i) through (ii) of this subsection; and, within ninety days after receipt of biological monitoring results, provide a full medical examination to the employee in accordance with the requirements of subsection (4)(b) of this section. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the employee. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 7 µg/g Cr; or CdB exceeds 10 µg/lwb; or β₂-M exceeds 750 µg/g Cr, and in addition CdU exceeds 3 µg/g Cr or CdB exceeds 5 µg/liter of whole blood, then the physician shall medically remove the employee from exposure to cadmium at or above the action level. If the second set of biological monitoring results obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the employee is not required to be removed by the mandatory provisions of this section. If the employee is not required to be removed by the mandatory provisions of this section or by the physician's determination, then until the employee's CdU level falls to or below 3 µg/g Cr, β₂-M level falls to or below 300 µg/g Cr and CdB level falls to or below 5 µg/lwb, the

employer shall: periodically reassess the employee's occupational exposure to cadmium; provide biological monitoring in accordance with subsection (2)(b)(ii) of this section on a quarterly basis; and provide semiannual medical examinations in accordance with subsection (4)(b) of this section.

(4) Periodic medical surveillance.

(a) For each employee who is covered under subsection (1)(a)(i) of this section, the employer shall provide at least the minimum level of periodic medical surveillance, which consists of periodic medical examinations and periodic biological monitoring. A periodic medical examination shall be provided within one year after the initial examination required by subsection (2) of this section and thereafter at least biennially. Biological sampling shall be provided at least annually, either as part of a periodic medical examination or separately as periodic biological monitoring.

(b) The periodic medical examination shall include:

(i) A detailed medical and work history, or update thereof, with emphasis on: Past, present and anticipated future exposure to cadmium; smoking history and current status; reproductive history; current use of medications with potential nephrotoxic side-effects; any history of renal, cardiovascular, respiratory, hematopoietic, and/or musculoskeletal system dysfunction; and as part of the medical and work history, for employees who wear respirators, questions 3-11 and 25-32 in WAC 296-62-07447, Appendix D;

(ii) A complete physical examination with emphasis on: Blood pressure, the respiratory system, and the urinary system;

(iii) A 14 inch by 17 inch, or a reasonably standard sized posterior-anterior chest X-ray (after the initial X-ray, the frequency of chest X-rays is to be determined by the examining physician);

(iv) Pulmonary function tests, including forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV1);

(v) Biological monitoring, as required in subsection (2)(b)(ii) of this section;

(vi) Blood analysis, in addition to the analysis required under this section, including blood urea nitrogen, complete blood count, and serum creatinine;

(vii) Urinalysis, in addition to the analysis required under subsection (2)(b)(ii) of this section, including the determination of albumin, glucose, and total and low molecular weight proteins;

(viii) For males over forty years old, prostate palpation, or other at least as effective diagnostic test(s); and

(ix) Any additional tests deemed appropriate by the examining physician.

(c) Periodic biological monitoring shall be provided in accordance with subsection (2)(b)(ii) of this section.

(d) If the results of periodic biological monitoring or the results of biological monitoring performed as part of the periodic medical examination show the level of the employee's CdU, β_2 -M, or CdB to be in excess of the levels specified in subsection (3)(b) or (c) of this section; or, beginning on January 1, 1999, in excess of the levels specified in subsection (3)(b) or (d) of this section, the employer shall take the appropriate actions specified in subsection (3)(b) through (d) of this section.

(e) For previously exposed employees under subsection (1)(a)(ii) of this section:

(i) If the employee's levels of CdU did not exceed 3 μ g/g Cr, CdB did not exceed 5 μ g/lwb, and β_2 -M did not exceed 300 μ g/g Cr in the initial biological monitoring tests, and if the results of the followup biological monitoring required by subsection (3)(a)(ii) of this section one year after the initial examination confirm the previous results, the employer may discontinue all periodic medical surveillance for that employee.

(ii) If the initial biological monitoring results for CdU, CdB, or β_2 -M were in excess of the levels specified in subsection (3)(a) of this section, but subsequent biological monitoring results required by subsection (3)(b) through (e) of this section show that the employee's CdU levels no longer exceed 3 μ g/g Cr, CdB levels no longer exceed 5 μ g/lwb, and β_2 -M levels no longer exceed 300 μ g/g Cr, the employer shall provide biological monitoring for CdU, CdB, and β_2 -M one year after these most recent biological monitoring results. If the results of the followup biological monitoring, specified in this section, confirm the previous results, the employer may discontinue all periodic medical surveillance for that employee.

(iii) However, if the results of the follow-up tests specified in (e)(i) or (ii) of this subsection indicate that the level of the employee's CdU, β_2 -M, or CdB exceeds these same levels, the employer is required to provide annual medical examinations in accordance with the provisions of (b) of this subsection until the results of biological monitoring are consistently below these levels or the examining physician determines in a written medical opinion that further medical surveillance is not required to protect the employee's health.

(f) A routine, biennial medical examination is not required to be provided in accordance with subsections (3)(a) and (4) of this section if adequate medical records show that the employee has been examined in accordance with the requirements of (b) of this subsection within the past twelve months. In that case, such records shall be maintained by the employer as part of the employee's medical record, and the next routine, periodic medical examination shall be made available to the employee within two years of the previous examination.

(5) Actions triggered by medical examinations.

If the results of a medical examination carried out in accordance with this section indicate any laboratory or clinical finding consistent with cadmium toxicity that does not require employer action under subsections (2), (3), or (4) of this section, the employer, within thirty days, shall reassess the employee's occupational exposure to cadmium and take the following corrective action until the physician determines they are no longer necessary:

(a) Periodically reassess: The employee's work practices and personal hygiene; the employee's respirator use, if any; the employee's smoking history and status; the respiratory protection program; the hygiene facilities; and the maintenance and effectiveness of the relevant engineering controls;

(b) Within thirty days after the reassessment, take all reasonable steps to correct the deficiencies found in the reassess-

ment that may be responsible for the employee's excess exposure to cadmium;

(c) Provide semiannual medical reexaminations to evaluate the abnormal clinical sign(s) of cadmium toxicity until the results are normal or the employee is medically removed; and

(d) Where the results of tests for total proteins in urine are abnormal, provide a more detailed medical evaluation of the toxic effects of cadmium on the employee's renal system.

(6) Examination for respirator use.

(a) To determine an employee's fitness for respirator use, the employer shall provide a medical examination that includes the elements specified in (a)(i) through (iv) of this subsection. This examination shall be provided prior to the employee's being assigned to a job that requires the use of a respirator or no later than ninety days after this section goes into effect, whichever date is later, to any employee without a medical examination within the preceding twelve months that satisfies the requirements of this paragraph.

(i) A detailed medical and work history, or update thereof, with emphasis on: Past exposure to cadmium; smoking history and current status; any history of renal, cardiovascular, respiratory, hematopoietic, and/or musculoskeletal system dysfunction; a description of the job for which the respirator is required; and questions 3 through 11 and 25 through 32 in WAC 296-62-07447, Appendix D;

(ii) A blood pressure test;

(iii) Biological monitoring of the employee's levels of CdU, CdB and β_2 -M in accordance with the requirements of subsection (2)(b)(ii) of this section, unless such results already have been obtained within the previous twelve months; and

(iv) Any other test or procedure that the examining physician deems appropriate.

(b) After reviewing all the information obtained from the medical examination required in (a) of this subsection, the physician shall determine whether the employee is fit to wear a respirator.

(c) Whenever an employee has exhibited difficulty in breathing during a respirator fit test or during use of a respirator, the employer, as soon as possible, shall provide the employee with a periodic medical examination in accordance with subsection (4)(b) of this section to determine the employee's fitness to wear a respirator.

(d) Where the results of the examination required under (a), (b), or (c) of this subsection are abnormal, medical limitation or prohibition of respirator use shall be considered. If the employee is allowed to wear a respirator, the employee's ability to continue to do so shall be periodically evaluated by a physician.

(7) Emergency examinations.

(a) In addition to the medical surveillance required in subsections (2) through (6) of this section, the employer shall provide a medical examination as soon as possible to any employee who may have been acutely exposed to cadmium because of an emergency.

(b) The examination shall include the requirements of subsection (4)(b) of this section, with emphasis on the respiratory system, other organ systems considered appropriate by the examining physician, and symptoms of acute overexpo-

sure, as identified in WAC 296-62-07441 (2)(b)(i) through (ii) and (4), Appendix A.

(8) Termination of employment examination.

(a) At termination of employment, the employer shall provide a medical examination in accordance with subsection (4)(b) of this section, including a chest x-ray, to any employee to whom at any prior time the employer was required to provide medical surveillance under subsection (1)(a) or (7) of this section. However, if the last examination satisfied the requirements of subsection (4)(b) of this section and was less than six months prior to the date of termination, no further examination is required unless otherwise specified in subsection (3) or (5) of this section;

(b) However, for employees covered by subsection (1)(a)(ii) of this section, if the employer has discontinued all periodic medical surveillance under subsection (4)(e) of this section, no termination of employment medical examination is required.

(9) Information provided to the physician. The employer shall provide the following information to the examining physician:

(a) A copy of this standard and appendices;

(b) A description of the affected employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to cadmium;

(c) The employee's former, current, and anticipated future levels of occupational exposure to cadmium;

(d) A description of any personal protective equipment, including respirators, used or to be used by the employee, including when and for how long the employee has used that equipment; and

(e) Relevant results of previous biological monitoring and medical examinations.

(10) Physician's written medical opinion.

(a) The employer shall promptly obtain a written, signed medical opinion from the examining physician for each medical examination performed on each employee. This written opinion shall contain:

(i) The physician's diagnosis for the employee;

(ii) The physician's opinion as to whether the employee has any detected medical condition(s) that would place the employee at increased risk of material impairment to health from further exposure to cadmium, including any indications of potential cadmium toxicity;

(iii) The results of any biological or other testing or related evaluations that directly assess the employee's absorption of cadmium;

(iv) Any recommended removal from, or limitation on the activities or duties of the employee or on the employee's use of personal protective equipment, such as respirators;

(v) A statement that the physician has clearly and carefully explained to the employee the results of the medical examination, including all biological monitoring results and any medical conditions related to cadmium exposure that require further evaluation or treatment, and any limitation on the employee's diet or use of medications.

(b) The employer promptly shall obtain a copy of the results of any biological monitoring provided by an employer to an employee independently of a medical examination under subsections (2) and (4) of this section, and, in lieu of a

written medical opinion, an explanation sheet explaining those results.

(c) The employer shall instruct the physician not to reveal orally or in the written medical opinion given to the employer specific findings or diagnoses unrelated to occupational exposure to cadmium.

(11) Medical removal protection (MRP).

(a) General.

(i) The employer shall temporarily remove an employee from work where there is excess exposure to cadmium on each occasion that medical removal is required under subsection (3), (4), or (6) of this section and on each occasion that a physician determines in a written medical opinion that a physician determines in a written medical opinion that the employee should be removed from such exposure. The physician's determination may be based on biological monitoring results, inability to wear a respirator, evidence of illness, other signs or symptoms of cadmium-related dysfunction or disease, or any other reason deemed medically sufficient by the physician.

(ii) The employer shall medically remove an employee in accordance with this subsection regardless of whether at the time of removal a job is available into which the removed employee may be transferred.

(iii) Whenever an employee is medically removed under this subsection, the employer shall transfer the removed employee to a job where the exposure to cadmium is within the permissible levels specified in that subsection as soon as one becomes available.

(iv) For any employee who is medically removed under the provisions of (a) of this subsection, the employer shall provide follow-up biological monitoring in accordance with subsection (2)(b)(ii) of this section at least every three months and follow-up medical examinations semiannually at least every six months until in a written medical opinion the examining physician determines that either the employee may be returned to his/her former job status as specified under (d) through (e) of this subsection or the employee must be permanently removed from excess cadmium exposure.

(v) The employer may not return an employee who has been medically removed for any reason to his/her former job status until a physician determines in a written medical opinion that continued medical removal is no longer necessary to protect the employee's health.

(b) Where an employee is found unfit to wear a respirator under subsection (6)(b) of this section, the employer shall remove the employee from work where exposure to cadmium is above the PEL.

(c) Where removal is based on any reason other than the employee's inability to wear a respirator, the employer shall remove the employee from work where exposure to cadmium is at or above the action level.

(d) Except as specified in (e) of this subsection, no employee who was removed because his/her level of CdU, CdB and/or β_2 -M exceeded the medical removal trigger levels in subsection (3) or (4) of this section may be returned to work with exposure to cadmium at or above the action level until the employee's levels of CdU fall to or below 3 $\mu\text{g/g}$ Cr, CdB falls to or below 5 $\mu\text{g/lwb}$, and β_2 -M falls to or below 300 $\mu\text{g/g}$ Cr.

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(e) However, when in the examining physician's opinion continued exposure to cadmium will not pose an increased risk to the employee's health and there are special circumstances that make continued medical removal an inappropriate remedy, the physician shall fully discuss these matters with the employee, and then in a written determination may return a worker to his/her former job status despite what would otherwise be unacceptably high biological monitoring results. Thereafter, the returned employee shall continue to be provided with medical surveillance as if he/she were still on medical removal until the employee's levels of CdU fall to or below 3 $\mu\text{g/g}$ Cr, CdB falls to or below 5 $\mu\text{g/lwb}$, and β_2 -M falls to or below 300 $\mu\text{g/g}$ Cr.

(f) Where an employer, although not required by (a) through (c) of this subsection to do so, removes an employee from exposure to cadmium or otherwise places limitations on an employee due to the effects of cadmium exposure on the employee's medical condition, the employer shall provide the same medical removal protection benefits to that employee under subsection (12) of this section as would have been provided had the removal been required under (a) through (c) of this subsection.

(12) Medical removal protection benefits (MRPB).

(a) The employer shall provide MRPB for up to a maximum of eighteen months to an employee each time and while the employee is temporarily medically removed under subsection (11) of this section.

(b) For purposes of this section, the requirement that the employer provide MRPB means that the employer shall maintain the total normal earnings, seniority, and all other employee rights and benefits of the removed employee, including the employee's right to his/her former job status, as if the employee had not been removed from the employee's job or otherwise medically limited.

(c) Where, after eighteen months on medical removal because of elevated biological monitoring results, the employee's monitoring results have not declined to a low enough level to permit the employee to be returned to his/her former job status:

(i) The employer shall make available to the employee a medical examination pursuant in order to obtain a final medical determination as to whether the employee may be returned to his/her former job status or must be permanently removed from excess cadmium exposure; and

(ii) The employer shall assure that the final medical determination indicates whether the employee may be returned to his/her former job status and what steps, if any, should be taken to protect the employee's health.

(d) The employer may condition the provision of MRPB upon the employee's participation in medical surveillance provided in accordance with this section.

(13) Multiple physician review.

(a) If the employer selects the initial physician to conduct any medical examination or consultation provided to an employee under this section, the employee may designate a second physician to:

(i) Review any findings, determinations, or recommendations of the initial physician; and

(ii) Conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.

(b) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician provided by the employer conducts a medical examination or consultation pursuant to this section. The employer may condition its participation in, and payment for, multiple physician review upon the employee doing the following within fifteen days after receipt of this notice, or receipt of the initial physician's written opinion, whichever is later:

(i) Informing the employer that he or she intends to seek a medical opinion; and

(ii) Initiating steps to make an appointment with a second physician.

(c) If the findings, determinations, or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve any disagreement.

(d) If the two physicians have been unable to quickly resolve their disagreement, then the employer and the employee, through their respective physicians, shall designate a third physician to:

(i) Review any findings, determinations, or recommendations of the other two physicians; and

(ii) Conduct such examinations, consultations, laboratory tests, and discussions with the other two physicians as the third physician deems necessary to resolve the disagreement among them.

(e) The employer shall act consistently with the findings, determinations, and recommendations of the third physician, unless the employer and the employee reach an agreement that is consistent with the recommendations of at least one of the other two physicians.

(14) Alternate physician determination. The employer and an employee or designated employee representative may agree upon the use of any alternate form of physician determination in lieu of the multiple physician review provided by subsection (13) of this section, so long as the alternative is expeditious and at least as protective of the employee.

(15) Information the employer must provide the employee.

(a) The employer shall provide a copy of the physician's written medical opinion to the examined employee within two weeks after receipt thereof.

(b) The employer shall provide the employee with a copy of the employee's biological monitoring results and an explanation sheet explaining the results within two weeks after receipt thereof.

(c) Within thirty days after a request by an employee, the employer shall provide the employee with the information the employer is required to provide the examining physician under subsection (9) of this section.

(16) Reporting. In addition to other medical events that are required to be reported on the OSHA Form No. 200, the employer shall report any abnormal condition or disorder caused by occupational exposure to cadmium associated with employment as specified in WAC 296-27-060.

[Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-62-07423, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07423, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07425 Communication of cadmium hazards to employees. (1) General. In communications concerning cadmium hazards, employers shall comply with the requirements of WISHA's Hazard Communication Standard, chapter 296-62 WAC, Part C, including but not limited to the requirements concerning warning signs and labels, material safety data sheets (MSDS), and employee information and training. In addition, employers shall comply with the following requirements:

(2) Warning signs.

(a) Warning signs shall be provided and displayed in regulated areas. In addition, warning signs shall be posted at all approaches to regulated areas so that an employee may read the signs and take necessary protective steps before entering the area.

(b) Warning signs required by (a) of this subsection shall bear the following information:

DANGER CADMIUM CANCER HAZARD CAN CAUSE LUNG
AND KIDNEY DISEASE AUTHORIZED PERSONNEL ONLY
RESPIRATORS REQUIRED IN THIS AREA

(c) The employer shall assure that signs required by this subsection are illuminated, cleaned, and maintained as necessary so that the legend is readily visible.

(3) Warning labels.

(a) Shipping and storage containers containing cadmium, cadmium compounds, or cadmium contaminated clothing, equipment, waste, scrap, or debris shall bear appropriate warning labels, as specified in (b) of this subsection.

(b) The warning labels shall include at least the following information:

DANGER CONTAINS CADMIUM CANCER HAZARD AVOID
CREATING DUST CAN CAUSE LUNG AND KIDNEY DISEASE

(c) Where feasible, installed cadmium products shall have a visible label or other indication that cadmium is present.

(4) Employee information and training.

(a) The employer shall institute a training program for all employees who are potentially exposed to cadmium, assure employee participation in the program, and maintain a record of the contents of such program.

(b) Training shall be provided prior to or at the time of initial assignment to a job involving potential exposure to cadmium and at least annually thereafter.

(c) The employer shall make the training program understandable to the employee and shall assure that each employee is informed of the following:

(i) The health hazards associated with cadmium exposure, with special attention to the information incorporated in WAC 296-62-07441, Appendix A;

(ii) The quantity, location, manner of use, release, and storage of cadmium in the workplace and the specific nature of operations that could result in exposure to cadmium, especially exposures above the PEL;

(iii) The engineering controls and work practices associated with the employee's job assignment;

(iv) The measures employees can take to protect themselves from exposure to cadmium, including modification of such habits as smoking and personal hygiene, and specific procedures the employer has implemented to protect employees from exposure to cadmium such as appropriate work practices, emergency procedures, and the provision of personal protective equipment;

(v) The purpose, proper selection, fitting, proper use, and limitations of protective clothing;

(vi) The purpose and a description of the medical surveillance program required by WAC 296-62-07423;

(vii) The contents of this section and its appendices;

(viii) The employee's rights of access to records under WAC 296-62-05213; and

(ix) The purpose, proper use, limitations, and other training requirements for respiratory protection as required in chapter 296-62 WAC, Part E.

(d) Additional access to information and training program and materials.

(i) The employer shall make a copy of this section and its appendices readily available without cost to all affected employees and shall provide a copy if requested.

(ii) The employer shall provide to the director, upon request, all materials relating to the employee information and the training program.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07425, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-62-07425, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07425, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07427 Recordkeeping. (1) Exposure monitoring.

(a) The employer shall establish and keep an accurate record of all air monitoring for cadmium in the workplace.

(b) This record shall include at least the following information:

(i) The monitoring date, duration, and results in terms of an 8-hour TWA of each sample taken;

(ii) The name, Social Security number, and job classification of the employees monitored and of all other employees whose exposures the monitoring is intended to represent;

(iii) A description of the sampling and analytical methods used and evidence of their accuracy;

(iv) The type of respiratory protective device, if any, worn by the monitored employee;

(v) A notation of any other conditions that might have affected the monitoring results.

(c) The employer shall maintain this record for at least thirty years, in accordance with chapter 296-62 WAC, Part B.

(2) Objective data for exemption from requirement for initial monitoring.

(a) For purposes of this section, objective data are information demonstrating that a particular product or material containing cadmium or a specific process, operation, or activity involving cadmium cannot release dust or fumes in concentrations at or above the action level even under the worst-

case release conditions. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of cadmium-containing products or materials. The data the employer uses from an industry-wide survey must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the employer's current operations.

(b) The employer shall establish and maintain a record of the objective data for at least thirty years.

(3) Medical surveillance.

(a) The employer shall establish and maintain an accurate record for each employee covered by medical surveillance under WAC 296-62-07423 (1)(a).

(b) The record shall include at least the following information about the employee:

(i) Name, Social Security number, and description of the duties;

(ii) A copy of the physician's written opinions and an explanation sheet for biological monitoring results;

(iii) A copy of the medical history, and the results of any physical examination and all test results that are required to be provided by this section, including biological tests, x-rays, pulmonary function tests, etc., or that have been obtained to further evaluate any condition that might be related to cadmium exposure;

(iv) The employee's medical symptoms that might be related to exposure to cadmium; and

(v) A copy of the information provided to the physician as required by WAC 296-62-07423 (9)(b) through (e).

(c) The employer shall assure that this record is maintained for the duration of employment plus thirty years, in accordance with chapter 296-62 WAC, Part B.

(4) Training. The employer shall certify that employees have been trained by preparing a certification record which includes the identity of the person trained, the signature of the employer or the person who conducted the training, and the date the training was completed. The certification records shall be prepared at the completion of training and shall be maintained on file for one year beyond the date of training of that employee.

(5) Availability.

(a) Except as otherwise provided for in this section, access to all records required to be maintained by subsections (1) through (4) of this section shall be in accordance with the provisions of chapter 296-62 WAC, Part B.

(b) Within fifteen days after a request, the employer shall make an employee's medical records required to be kept by subsection (3) of this section available for examination and copying to the subject employee, to designated representatives, to anyone having the specific written consent of the subject employee, and after the employee's death or incapacitation, to the employee's family members.

(6) Transfer of records. Whenever an employer ceases to do business and there is no successor employer to receive and retain records for the prescribed period or the employer intends to dispose of any records required to be preserved for at least thirty years, the employer shall comply with the requirements concerning transfer of records set forth in WAC 296-62-05215.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07427, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07429 Observation of monitoring. (1) Employee observation. The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to cadmium.

(2) Observation procedures. When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the observer with that clothing and equipment and shall assure that the observer uses such clothing and equipment and complies with all other applicable safety and health procedures.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07429, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07433 Appendices. WAC 296-62-07441, Appendix A; WAC 296-62-07443, Appendix B; WAC 296-62-07447, Appendix D; WAC 296-62-07449, Appendix E; and WAC 296-62-07451, Appendix F are non-mandatory appendices and are not intended to create any additional obligations.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-17-094, § 296-62-07433, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07433, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07441 Appendix A, substance safety data sheet—Cadmium. (1) Substance identification.

(a) Substance: Cadmium.

(b) 8-Hour, time-weighted-average, permissible exposure limit (TWA PEL):

(c) TWA PEL: Five micrograms of cadmium per cubic meter of air 5 µg/m³, time-weighted average (TWA) for an 8-hour workday.

(d) Appearance: Cadmium metal—soft, blue-white, malleable, lustrous metal or grayish-white powder. Some cadmium compounds may also appear as a brown, yellow, or red powdery substance.

(2) Health hazard data.

(a) Routes of exposure. Cadmium can cause local skin or eye irritation. Cadmium can affect your health if you inhale it or if you swallow it.

(b) Effects of overexposure.

(i) Short-term (acute) exposure: Cadmium is much more dangerous by inhalation than by ingestion. High exposures to cadmium that may be immediately dangerous to life or health occur in jobs where workers handle large quantities of cadmium dust or fume; heat cadmium-containing compounds or cadmium-coated surfaces; weld with cadmium solders or cut cadmium-containing materials such as bolts.

(ii) Severe exposure may occur before symptoms appear. Early symptoms may include mild irritation of the upper respiratory tract, a sensation of constriction of the throat, a metallic taste and/or a cough. A period of one to ten hours may precede the onset of rapidly progressing shortness of breath, chest pain, and flu-like symptoms with weakness, fever, headache, chills, sweating, and muscular pain. Acute

pulmonary edema usually develops within twenty-four hours and reaches a maximum by three days. If death from asphyxia does not occur, symptoms may resolve within a week.

(iii) Long-term (chronic) exposure. Repeated or long-term exposure to cadmium, even at relatively low concentrations, may result in kidney damage and an increased risk of cancer of the lung and of the prostate.

(c) Emergency first aid procedures.

(i) Eye exposure: Direct contact may cause redness or pain. Wash eyes immediately with large amounts of water, lifting the upper and lower eyelids. Get medical attention immediately.

(ii) Skin exposure: Direct contact may result in irritation. Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water. Get medical attention immediately.

(iii) Ingestion: Ingestion may result in vomiting, abdominal pain, nausea, diarrhea, headache, and sore throat. Treatment for symptoms must be administered by medical personnel. Under no circumstances should the employer allow any person whom he/she retains, employs, supervises, or controls to engage in therapeutic chelation. Such treatment is likely to translocate cadmium from pulmonary or other tissue to renal tissue. Get medical attention immediately.

(iv) Inhalation: If large amounts of cadmium are inhaled, the exposed person must be moved to fresh air at once. If breathing has stopped, perform cardiopulmonary resuscitation. Administer oxygen if available. Keep the affected person warm and at rest. Get medical attention immediately.

(v) Rescue: Move the affected person from the hazardous exposure. If the exposed person has been overcome, attempt rescue only after notifying at least one other person of the emergency and putting into effect established emergency procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the location of the emergency equipment before the need arises.

(3) Employee information.

(a) Protective clothing and equipment.

(i) Respirators: You may be required to wear a respirator for nonroutine activities; in emergencies; while your employer is in the process of reducing cadmium exposures through engineering controls; and where engineering controls are not feasible. If air-purifying respirators are worn, they must have a label issued by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 42 CFR part 84 stating that the respirators have been certified for use with cadmium. Cadmium does not have a detectable odor except at levels well above the permissible exposure limits. If you can smell cadmium while wearing a respirator, proceed immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

(ii) Protective clothing: You may be required to wear impermeable clothing, gloves, foot gear, a face shield, or other appropriate protective clothing to prevent skin contact with cadmium. Where protective clothing is required, your employer must provide clean garments to you as necessary to assure that the clothing protects you adequately. The

employer must replace or repair protective clothing that has become torn or otherwise damaged.

(iii) Eye protection: You may be required to wear splash-proof or dust resistant goggles to prevent eye contact with cadmium.

(b) Employer requirements.

(i) Medical: If you are exposed to cadmium at or above the action level, your employer is required to provide a medical examination, laboratory tests and a medical history according to the medical surveillance provisions under WAC 296-62-07423. (See summary chart and tables in this section, appendix A.) These tests shall be provided without cost to you. In addition, if you are accidentally exposed to cadmium under conditions known or suspected to constitute toxic exposure to cadmium, your employer is required to make special tests available to you.

(ii) Access to records: All medical records are kept strictly confidential. You or your representative are entitled to see the records of measurements of your exposure to cadmium. Your medical examination records can be furnished to your personal physician or designated representative upon request by you to your employer.

(iii) Observation of monitoring: Your employer is required to perform measurements that are representative of your exposure to cadmium and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear the protective clothing and equipment.

(c) Employee requirements. You will not be able to smoke, eat, drink, chew gum or tobacco, or apply cosmetics while working with cadmium in regulated areas. You will also not be able to carry or store tobacco products, gum, food, drinks, or cosmetics in regulated areas because these products easily become contaminated with cadmium from the workplace and can therefore create another source of unnecessary cadmium exposure. Some workers will have to change out of work clothes and shower at the end of the day, as part of their workday, in order to wash cadmium from skin and hair. Handwashing and cadmium-free eating facilities shall be provided by the employer and proper hygiene should always be performed before eating. It is also recommended that you do not smoke or use tobacco products, because among other things, they naturally contain cadmium. For further information, read the labeling on such products.

(4) Physician information.

(a) Introduction. The medical surveillance provisions of WAC 296-62-07423 generally are aimed at accomplishing three main interrelated purposes: First, identifying employees at higher risk of adverse health effects from excess, chronic exposure to cadmium; second, preventing cadmium-induced disease; and third, detecting and minimizing existing cadmium-induced disease. The core of medical surveillance in this standard is the early and periodic monitoring of the employee's biological indicators of:

(i) Recent exposure to cadmium;

(ii) Cadmium body burden; and

(iii) Potential and actual kidney damage associated with exposure to cadmium. The main adverse health effects associated with cadmium overexposure are lung cancer and kidney dysfunction. It is not yet known how to adequately biologically monitor human beings to specifically prevent cadmium-induced lung cancer. By contrast, the kidney can be monitored to provide prevention and early detection of cadmium-induced kidney damage. Since, for noncarcinogenic effects, the kidney is considered the primary target organ of chronic exposure to cadmium, the medical surveillance provisions of this standard effectively focus on cadmium-induced kidney disease. Within that focus, the aim, where possible, is to prevent the onset of such disease and, where necessary, to minimize such disease as may already exist. The by-products of successful prevention of kidney disease are anticipated to be the reduction and prevention of other cadmium-induced diseases.

(b) Health effects. The major health effects associated with cadmium overexposure are described below.

(i) Kidney: The most prevalent nonmalignant disease observed among workers chronically exposed to cadmium is kidney dysfunction. Initially, such dysfunction is manifested as proteinuria. The proteinuria associated with cadmium exposure is most commonly characterized by excretion of low-molecular weight proteins (15,000 to 40,000 MW) accompanied by loss of electrolytes, uric acid, calcium, amino acids, and phosphate. The compounds commonly excreted include: beta-2-microglobulin (β_2 -M), retinol binding protein (RBP), immunoglobulin light chains, and lysozyme. Excretion of low molecular weight proteins are characteristic of damage to the proximal tubules of the kidney (Iwao et al., 1980). It has also been observed that exposure to cadmium may lead to urinary excretion of high-molecular weight proteins such as albumin, immunoglobulin G, and glycoproteins (Ex. 29). Excretion of high-molecular weight proteins is typically indicative of damage to the glomeruli of the kidney. Bernard et al., (1979) suggest that damage to the glomeruli and damage to the proximal tubules of the kidney may both be linked to cadmium exposure but they may occur independently of each other. Several studies indicate that the onset of low-molecular weight proteinuria is a sign of irreversible kidney damage (Friberg et al., 1974; Roels et al., 1982; Piscator 1984; Elinder et al., 1985; Smith et al., 1986). Above specific levels of β_2 -M associated with cadmium exposure it is unlikely that β_2 -M levels return to normal even when cadmium exposure is eliminated by removal of the individual from the cadmium work environment (Friberg, Ex. 29, 1990). Some studies indicate that such proteinuria may be progressive; levels of β_2 -M observed in the urine increase with time even after cadmium exposure has ceased. See, for example, Elinder et al., 1985. Such observations, however, are not universal, and it has been suggested that studies in which proteinuria has not been observed to progress may not have tracked patients for a sufficiently long time interval (Jarup, Ex. 8-661). When cadmium exposure continues after the onset of proteinuria, chronic nephrotoxicity may occur (Friberg, Ex. 29). Uremia results from the inability of the glomerulus to adequately filter blood. This

leads to severe disturbance of electrolyte concentrations and may lead to various clinical complications including kidney stones (L-140-50). After prolonged exposure to cadmium, glomerular proteinuria, glucosuria, aminoaciduria, phosphaturia, and hypercalciuria may develop (Exs. 8-86, 4-28, 14-18). Phosphate, calcium, glucose, and amino acids are essential to life, and under normal conditions, their excretion should be regulated by the kidney. Once low molecular weight proteinuria has developed, these elements dissipate from the human body. Loss of glomerular function may also occur, manifested by decreased glomerular filtration rate and increased serum creatinine. Severe cadmium-induced renal damage may eventually develop into chronic renal failure and uremia (Ex. 55). Studies in which animals are chronically exposed to cadmium confirm the renal effects observed in humans (Friberg et al., 1986). Animal studies also confirm problems with calcium metabolism and related skeletal effects which have been observed among humans exposed to cadmium in addition to the renal effects. Other effects commonly reported in chronic animal studies include anemia, changes in liver morphology, immunosuppression and hypertension. Some of these effects may be associated with co-factors. Hypertension, for example, appears to be associated with diet as well as cadmium exposure. Animals injected with cadmium have also shown testicular necrosis (Ex. 8-86B).

(ii) Biological markers. It is universally recognized that the best measures of cadmium exposures and its effects are measurements of cadmium in biological fluids, especially urine and blood. Of the two, CdU is conventionally used to determine body burden of cadmium in workers without kidney disease. CdB is conventionally used to monitor for recent exposure to cadmium. In addition, levels of CdU and CdB historically have been used to predict the percent of the population likely to develop kidney disease (Thun et al., Ex. L-140-50; WHO, Ex. 8-674; ACGIH, Exs. 8-667, 140-50). The third biological parameter upon which WISHA relies for medical surveillance is beta-2-microglobulin in urine (β_2 -M), a low molecular weight protein. Excess β_2 -M has been widely accepted by physicians and scientists as a reliable indicator of functional damage to the proximal tubule of the kidney (Exs. 8-447, 144-3-C, 4-47, L-140-45, 19-43-A). Excess β_2 -M is found when the proximal tubules can no longer reabsorb this protein in a normal manner. This failure of the proximal tubules is an early stage of a kind of kidney disease that commonly occurs among workers with excessive cadmium exposure. Used in conjunction with biological test results indicating abnormal levels of CdU and CdB, the finding of excess β_2 -M can establish for an examining physician that any existing kidney disease is probably cadmium-related (Trs. 6/6/90, pp. 82-86, 122, 134). The upper limits of normal levels for cadmium in urine and cadmium in blood are 3 μ g Cd/gram creatinine in urine and 5 μ gCd/liter whole blood, respectively. These levels were derived from broad-based population studies. Three issues confront the physicians in the use of β_2 -M as a marker of kidney dysfunction and material impairment. First, there are a few other causes of elevated levels of β_2 -M not related to cadmium exposures, some of which may be rather common diseases and some of which are serious

diseases (e.g., myeloma or transient flu, Exs. 29 and 8-086). These can be medically evaluated as alternative causes (Friberg, Ex. 29). Also, there are other factors that can cause β_2 -M to degrade so that low levels would result in workers with tubular dysfunction. For example, regarding the degradation of β_2 -M, workers with acidic urine (pH<6) might have β_2 -M levels that are within the "normal" range when in fact kidney dysfunction has occurred (Ex. L-140-1) and the low molecular weight proteins are degraded in acid urine. Thus, it is very important that the pH of urine be measured, that urine samples be buffered as necessary (See WAC 296-62-07451, appendix F.), and that urine samples be handled correctly, i.e., measure the pH of freshly voided urine samples, then if necessary, buffer to pH>6 (or above for shipping purposes), measure pH again and then, perhaps, freeze the sample for storage and shipping. (See also WAC 296-62-07451, appendix F.) Second, there is debate over the pathological significance of proteinuria, however, most world experts believe that β_2 -M levels greater than 300 μ g/g Cr are abnormal (Elinder, Ex. 55, Friberg, Ex. 29). Such levels signify kidney dysfunction that constitutes material impairment of health. Finally, detection of β_2 -M at low levels has often been considered difficult, however, many laboratories have the capability of detecting excess β_2 -M using simple kits, such as the Phadebas Delphia test, that are accurate to levels of 100 μ g β_2 -M/g Cr U (Ex. L-140-1). Specific recommendations for ways to measure β_2 -M and proper handling of urine samples to prevent degradation of β_2 -M have been addressed by WISHA in WAC 296-62-07451, appendix F, in the section on laboratory standardization. All biological samples must be analyzed in a laboratory that is proficient in the analysis of that particular analyte, under WAC 296-62-07423 (1)(d). (See WAC 296-62-07451, appendix F). Specifically, under WAC 296-62-07423 (1)(d), the employer is to assure that the collecting and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (β_2 -M) taken from employees is collected in a manner that assures reliability. The employer must also assure that analysis of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (β_2 -M) taken from employees is performed in laboratories with demonstrated proficiency for that particular analyte. (See WAC 296-62-07451, appendix F).

(iii) Lung and prostate cancer. The primary sites for cadmium-associated cancer appear to be the lung and the prostate (L-140-50). Evidence for an association between cancer and cadmium exposure derives from both epidemiological studies and animal experiments. Mortality from prostate cancer associated with cadmium is slightly elevated in several industrial cohorts, but the number of cases is small and there is not clear dose-response relationship. More substantive evidence exists for lung cancer. The major epidemiological study of lung cancer was conducted by Thun et al., (Ex. 4-68). Adequate data on cadmium exposures were available to allow evaluation of dose-response relationships between cadmium exposure and lung cancer. A statistically significant excess of lung cancer attributed to cadmium exposure was observed in this study even when confounding variables such

as co-exposure to arsenic and smoking habits were taken into consideration (Ex. L-140-50). The primary evidence for quantifying a link between lung cancer and cadmium exposure from animal studies derives from two rat bioassay studies; one by Takenaka et al., (1983), which is a study of cadmium chloride and a second study by Oldiges and Glaser (1990) of four cadmium compounds. Based on the above cited studies, the U.S. Environmental Protection Agency (EPA) classified cadmium as "B1", a probable human carcinogen, in 1985 (Ex. 4-4). The International Agency for Research on Cancer (IARC) in 1987 also recommended that cadmium be listed as "2A", a probable human carcinogen (Ex. 4-15). The American Conference of Governmental Industrial Hygienists (ACGIH) has recently recommended that cadmium be labeled as a carcinogen. Since 1984, NIOSH has concluded that cadmium is possibly a human carcinogen and has recommended that exposures be controlled to the lowest level feasible.

(iv) Noncarcinogenic effects. Acute pneumonitis occurs 10 to 24 hours after initial acute inhalation of high levels of cadmium fumes with symptoms such as fever and chest pain (Exs. 30, 8-86B). In extreme exposure cases pulmonary edema may develop and cause death several days after exposure. Little actual exposure measurement data is available on the level of airborne cadmium exposure that causes such immediate adverse lung effects, nonetheless, it is reasonable to believe a cadmium concentration of approximately 1 mg/m³ over an eight hour period is "immediately dangerous" (55 FR 4052, ANSI; Ex. 8-86B). In addition to acute lung effects and chronic renal effects, long term exposure to cadmium may cause other severe effects on the respiratory system. Reduced pulmonary function and chronic lung disease indicative of emphysema have been observed in workers who have had prolonged exposure to cadmium dust or fumes (Exs. 4-29, 4-22, 4-42, 4-50, 4-63). In a study of workers conducted by Kazantzis et al., a statistically significant excess of worker deaths due to chronic bronchitis was found, which in his opinion was directly related to high cadmium exposures of 1 mg/m³ or more (Tr. 6/8/90, pp. 156-157). Cadmium need not be respirable to constitute a hazard. Inspirable cadmium particles that are too large to be respirable but small enough to enter the tracheobronchial region of the lung can lead to bronchoconstriction, chronic pulmonary disease, and cancer of that portion of the lung. All of these diseases have been associated with occupational exposure to cadmium (Ex. 8-86B). Particles that are constrained by their size to the extra-thoracic regions of the respiratory system such as the nose and maxillary sinuses can be swallowed through mucociliary clearance and be absorbed into the body (ACGIH, Ex. 8-692). The impaction of these particles in the upper airways can lead to anosmia, or loss of sense of smell, which is an early indication of overexposure among workers exposed to heavy metals. This condition is commonly reported among cadmium-exposed workers (Ex. 8-86-B).

(c) Medical surveillance. In general, the main provisions of the medical surveillance section of the standard, under WAC 296-62-07423 (1) through (16), are as follows:

- (i) Workers exposed above the action level are covered;
- (ii) Workers with intermittent exposures are not covered;

(iii) Past workers who are covered receive biological monitoring for at least one year;

(iv) Initial examinations include a medical questionnaire and biological monitoring of cadmium in blood (CdB), cadmium in urine (CdU), and Beta-2-microglobulin in urine (β_2 -M);

(v) Biological monitoring of these three analytes is performed at least annually; full medical examinations are performed biennially;

(vi) Until five years from the effective date of the standard, medical removal is required when CdU is greater than 15 μ g/gram creatinine (g Cr), or CdB is greater than 15 μ g/liter whole blood (lwb), or β_2 -M is greater than 1500 μ g/g Cr, and CdB is greater than 5 μ g/lwb or CdU is greater than 3 μ g/g Cr;

(vii) Beginning five years after the standard is in effect, medical removal triggers will be reduced;

(viii) Medical removal protection benefits are to be provided for up to eighteen months;

(ix) Limited initial medical examinations are required for respirator usage;

(x) Major provisions are fully described under WAC 296-62-07423; they are outlined here as follows:

(A) Eligibility.

(B) Biological monitoring.

(C) Actions triggered by levels of CdU, CdB, and β_2 -M (See Summary Charts and Tables in WAC 296-62-07441(5).)

(D) Periodic medical surveillance.

(E) Actions triggered by periodic medical surveillance (See appendix A Summary Chart and Tables in WAC 296-62-07441(5).)

(F) Respirator usage.

(G) Emergency medical examinations.

(H) Termination examination.

(I) Information to physician.

(J) Physician's medical opinion.

(K) Medical removal protection.

(L) Medical removal protection benefits.

(M) Multiple physician review.

(N) Alternate physician review.

(O) Information employer gives to employee.

(P) Recordkeeping.

(Q) Reporting on OSHA form 200.

(xi) The above mentioned summary of the medical surveillance provisions, the summary chart, and tables for the actions triggered at different levels of CdU, CdB and β_2 -M (in subsection (5) of this section, Attachment 1) are included only for the purpose of facilitating understanding of the provisions of WAC 296-62-07423(3) of the final cadmium standard. The summary of the provisions, the summary chart, and the tables do not add to or reduce the requirements in WAC 296-62-07423(3).

(d) Recommendations to physicians.

(i) It is strongly recommended that patients with tubular proteinuria are counseled on: The hazards of smoking; avoidance of nephrotoxins and certain prescriptions and over-the-counter medications that may exacerbate kidney symptoms; how to control diabetes and/or blood pressure; proper hydration, diet, and exercise (Ex. 19-2). A list of

prominent or common nephrotoxins is attached. (See subsection (6) of this section, Attachment 2.)

(ii) DO NOT CHELATE; KNOW WHICH DRUGS ARE NEPHROTOXINS OR ARE ASSOCIATED WITH NEPHRITIS.

(iii) The gravity of cadmium-induced renal damage is compounded by the fact there is no medical treatment to prevent or reduce the accumulation of cadmium in the kidney (Ex. 8-619). Dr. Friberg, a leading world expert on cadmium toxicity, indicated in 1992, that there is no form of chelating agent that could be used without substantial risk. He stated that tubular proteinuria has to be treated in the same way as other kidney disorders (Ex. 29).

(iv) After the results of a workers' biological monitoring or medical examination are received the employer is required to provide an information sheet to the patient, briefly explaining the significance of the results. (See subsection (7) of this section.)

(v) For additional information the physician is referred to the following additional resources:

(A) The physician can always obtain a copy of the OSHA final rule preamble, with its full discussion of the health effects, from OSHA's Computerized Information System (OCIS).

(B) The OSHA Docket Officer maintains a record of the OSHA rulemaking. The Cadmium Docket (H-057A), is located at 200 Constitution Ave. NW., Room N-2625, Washington, DC 20210; telephone: (202) 219-7894.

(C) The following articles and exhibits in particular from that docket (H-057A):

Exhibit number	Author and paper title
8-447	Lauwerys et. al., Guide for physicians, "Health Maintenance of Workers Exposed to Cadmium," published by the Cadmium Council.
4-67	Takenaka, S., H. Oldiges, H. Konig, D. Hochrainer, G. Oberdorster. "Carcinogenicity of Cadmium Chloride Aerosols in Wistar Rats". JNCI 70:367-373, 1983. (32)
4-68	Thun, M.J., T.M. Schnoor, A.B. Smith, W.E. Halperin, R.A. Lemen. "Mortality Among a Cohort of U.S. Cadmium Production Workers—An Update." JNCI 74(2):325-33, 1985. (8)
4-25	Elinder, C.G., Kjellstrom, T., Hogstedt, C., et al., "Cancer Mortality of Cadmium Workers." Brit. J. Ind. Med. 42:651-655, 1985. (14)
4-26	Ellis, K.J. et al., "Critical Concentrations of Cadmium in Human Renal Cortex: Dose Effect Studies to Cadmium Smelter Workers." J. Toxicol. Environ. Health 7:691-703, 1981. (76)
4-27	Ellis, K.J., S.H. Cohn and T.J. Smith. "Cadmium Inhalation Exposure Estimates: Their Significance with Respect to Kidney and Liver Cadmium Burden." J. Toxicol. Environ. Health 15:173-187, 1985.

Exhibit number	Author and paper title
4-28	Falck, F.Y., Jr., Fine, L.J., Smith, R.G., McClatchey, K.D., Annesley, T., England, B., and Schork, A.M. "Occupational Cadmium Exposure and Renal Status." Am. J. Ind. Med. 4:541, 1983. (64)
8-86A	Friberg, L., C.G. Elinder, et al., "Cadmium and Health a Toxicological and Epidemiological Appraisal, Volume I, Exposure, Dose, and Metabolism." CRC Press, Inc., Boca Raton, FL, 1986. (Available from the OSHA Technical Data Center)
8-86B	Friberg, L., C.G. Elinder, et al., "Cadmium and Health: A Toxicological and Epidemiological Appraisal, Volume II, Effects and Response." CRC Press, Inc., Boca Raton, FL, 1986. (Available from the OSHA Technical Data Center)
L-140-45	Elinder, C.G., "Cancer Mortality of Cadmium Workers", Brit. J. Ind. Med., 42, 651-655, 1985.
L-140-50	Thun, M., Elinder, C.G., Friberg, L., "Scientific Basis for an Occupational Standard for Cadmium, Am. J. Ind. Med., 20; 629-642, 1991.

(5) Information sheet. The information sheet (subsection (8) of this section, Attachment 3) or an equally explanatory one should be provided to you after any biological monitoring results are reviewed by the physician, or where applicable, after any medical examination.

(6) Attachment 1—Appendix A, summary chart and Tables A and B of actions triggered by biological monitoring.

(a) Summary chart: WAC 296-62-07423(3) Medical surveillance—Categorizing biological monitoring results.

(i) Biological monitoring results categories are set forth in Table A for the periods ending December 31, 1998, and for the period beginning January 1, 1999.

(ii) The results of the biological monitoring for the initial medical exam and the subsequent exams shall determine an employee's biological monitoring result category.

(b) Actions triggered by biological monitoring.

(i) The actions triggered by biological monitoring for an employee are set forth in Table B.

(ii) The biological monitoring results for each employee under WAC 296-62-07423(3) shall determine the actions required for that employee. That is, for any employee in biological monitoring category C, the employer will perform all of the actions for which there is an X in column C of Table B.

(iii) An employee is assigned the alphabetical category ("A" being the lowest) depending upon the test results of the three biological markers.

(iv) An employee is assigned category A if monitoring results for all three biological markers fall at or below the levels indicated in the table listed for category A.

(v) An employee is assigned category B if any monitoring result for any of the three biological markers fall within

the range of levels indicated in the table listed for category B, providing no result exceeds the levels listed for category B.

(vi) An employee is assigned category C if any monitoring result for any of the three biological markers are above the levels listed for category C.

(c) The user of Tables A and B should know that these tables are provided only to facilitate understanding of the relevant provisions of WAC 296-62-07423. Tables A and B are not meant to add to or subtract from the requirements of those provisions.

Table A
Categorization of Biological Monitoring Results

Biological marker	Applicable Through 1998 Only		
	Monitoring result categories		
	A	B	C
Cadmium in urine (CdU) (µg/g creatinine)	≤3	>3 and ≤15	>15
β ₂ -microglobulin (β ₂ -M) (µg/g creatinine)	≤300	>300 and ≤1500	>1500*
Cadmium in blood (CdB) (µg/liter whole blood)	≤5	>5 and ≤15	>15

* If an employee's β₂-M levels are above 1,500 µg/g creatinine, in order for mandatory medical removal to be required (See WAC 296-62-07441, Appendix A Table B.), either the employee's CdU level must also be >3 µg/g creatinine or CdB level must also be >5 µg/liter whole blood.

Biological marker	Applicable Beginning January 1, 1999		
	Monitoring result categories		
	A	B	C
Cadmium in urine (CdU) (µg/g creatinine)	≤3	>3 and ≤7	>7
β ₂ -microglobulin (β ₂ -M) (µg/g creatinine)	≤300	>300 and ≤750	>750*
Cadmium in blood (CdB) (µg/liter whole blood)	≤5	>5 and ≤10	>10

* If an employee's β₂-M levels are above 750 µg/g creatinine, in order for mandatory medical removal to be required (See WAC 296-62-07441, Appendix A Table B.), either the employee's CdU level must also be >3 µg/g creatinine or CdB level must also be >5 µg/liter whole blood.

Table B—Actions determined by biological monitoring.

This table presents the actions required based on the monitoring result in Table A. Each item is a separate requirement in citing noncompliance. For example, a medical examination within ninety days for an employee in category B is separate from the requirement to administer a periodic medical examination for category B employees on an annual basis.

Table B
Monitoring result category

Required actions	Monitoring result category		
	A ¹	B ¹	C ¹
(1) Biological monitoring:			
(a) Annual.	X		
(b) Semiannual		X	
(c) Quarterly			X
(2) Medical examination:			
(a) Biennial	X		
(b) Annual.		X	
(c) Semiannual.			X
(d) Within 90 days		X	X

(2001 Ed.)

Table B
Monitoring result category

	A ¹	B ¹	C ¹
(3) Assess within two weeks:			
(a) Excess cadmium exposure		X	X
(b) Work practices		X	X
(c) Personal hygiene		X	X
(d) Respirator usage		X	X
(e) Smoking history		X	X
(f) Hygiene facilities		X	X
(g) Engineering controls		X	X
(h) Correct within 30 days		X	X
(i) Periodically assess exposures			X
(4) Discretionary medical removal		X	X
(5) Mandatory medical removal			X ²

¹ For all employees covered by medical surveillance exclusively because of exposures prior to the effective date of this standard, if they are in Category A, the employer shall follow the requirements of WAC 296-62-07423 (3)(a)(ii) and (4)(e)(i). If they are in Category B or C, the employer shall follow the requirements of WAC 296-62-07423 (4)(e)(ii) and (iii).

² See footnote in Table A.

(7) Attachment 2, list of medications.

(a) A list of the more common medications that a physician, and the employee, may wish to review is likely to include some of the following:

(i) Anticonvulsants: Paramethadione, phenytoin, trimethadone;

(ii) Antihypertensive drugs: Captopril, methyldopa;

(iii) Antimicrobials: Aminoglycosides, amphotericin B, cephalosporins, ethambutol;

(iv) Antineoplastic agents: Cisplatin, methotrexate, mitomycin-C, nitrosoureas, radiation;

(v) Sulfonamide diuretics: Acetazolamide, chlorthalidone, furosemide, thiazides;

(vi) Halogenated alkanes, hydrocarbons, and solvents that may occur in some settings: Carbon tetrachloride, ethylene glycol, toluene; iodinated radiographic contrast media; nonsteroidal anti-inflammatory drugs; and

(vii) Other miscellaneous compounds: Acetaminophen, allopurinol, amphetamines, azathioprine, cimetidine, cyclosporine, lithium, methoxyflurane, methysergide, D-penicillamine, phenacetin, phenendione.

(b) A list of drugs associated with acute interstitial nephritis includes:

(i) Antimicrobial drugs: Cephalosporins, chloramphenicol, colistin, erythromycin, ethambutol, isoniazid, para-aminosalicylic acid, penicillins, polymyxin B, rifampin, sulfonamides, tetracyclines, and vancomycin;

(ii) Other miscellaneous drugs: Allopurinol, antipyrine, azathioprine, captopril, cimetidine, clofibrate, methyldopa, phenindione, phenylpropanolamine, phenytoin, probenecid, sulfapyrazone, sulfonamide diuretics, triamterene; and

(iii) Metals: Bismuth, gold. This list has been derived from commonly available medical textbooks (e.g., Ex. 14-18). The list has been included merely to facilitate the physician's, employer's, and employee's understanding. The list does not represent an official OSHA opinion or policy regarding the use of these medications for particular employ-

ees. The use of such medications should be under physician discretion.

(8) Attachment 3—Biological monitoring and medical examination results.

Employee _____

Testing _____

Date _____

Cadmium in Urine ___ $\mu\text{g/g Cr}$ —Normal Levels:
 $\leq 3 \mu\text{g/g Cr}$.

Cadmium in Blood ___ $\mu\text{g/lwb}$ —Normal Levels:
 $\leq 5 \mu\text{g/lwb}$.

Beta-2-microglobulin in Urine ___ $\mu\text{g/g Cr}$ —Normal
 Levels: $\leq 300 \mu\text{g/g Cr}$.

Physical Examination Results: N/A ___

Satisfactory ___

Unsatisfactory ___ (see physician again).

Physician's Review of Pulmonary Function Test:

N/A ___ Normal ___

Abnormal ___.

Next biological monitoring or medical examination
 scheduled for _____

(a) The biological monitoring program has been designed for three main purposes:

(i) To identify employees at risk of adverse health effects from excess, chronic exposure to cadmium;

(ii) To prevent cadmium-induced disease(s); and

(iii) To detect and minimize existing cadmium-induced disease(s).

(b) The levels of cadmium in the urine and blood provide an estimate of the total amount of cadmium in the body. The amount of a specific protein in the urine (beta-2-microglobulin) indicates changes in kidney function. All three tests must be evaluated together. A single mildly elevated result may not be important if testing at a later time indicates that the results are normal and the workplace has been evaluated to decrease possible sources of cadmium exposure. The levels of cadmium or beta-2-microglobulin may change over a period of days to months and the time needed for those changes to occur is different for each worker.

(c) If the results for biological monitoring are above specific "high levels" (cadmium urine greater than 10 micrograms per gram of creatinine $\mu\text{g/g Cr}$), cadmium blood greater than 10 micrograms per liter of whole blood ($\mu\text{g/lwb}$), or beta-2-microglobulin greater than 1000 micrograms per gram of creatinine ($\mu\text{g/g Cr}$), the worker has a much greater chance of developing other kidney diseases.

(d) One way to measure for kidney function is by measuring beta-2-microglobulin in the urine. Beta-2-microglobulin is a protein which is normally found in the blood as it is being filtered in the kidney, and the kidney reabsorbs or returns almost all of the beta-2-microglobulin to the blood. A very small amount (less than 300 $\mu\text{g/g Cr}$ in the urine) of beta-2-microglobulin is not reabsorbed into the blood, but is released in the urine. If cadmium damages the kidney, the amount of beta-2-microglobulin in the urine increases because the kidney cells are unable to reabsorb the beta-2-microglobulin normally. An increase in the amount of beta-2-microglobulin in the urine is a very early sign of kidney dys-

function. A small increase in beta-2-microglobulin in the urine will serve as an early warning sign that the worker may be absorbing cadmium from the air, cigarettes contaminated in the workplace, or eating in areas that are cadmium contaminated.

(e) Even if cadmium causes permanent changes in the kidney's ability to reabsorb beta-2-microglobulin, and the beta-2-microglobulin is above the "high levels," the loss of kidney function may not lead to any serious health problems. Also, renal function naturally declines as people age. The risk for changes in kidney function for workers who have biological monitoring results between the "normal values" and the "high levels" is not well known. Some people are more cadmium-tolerant, while others are more cadmium-susceptible.

(f) For anyone with even a slight increase of beta-2-microglobulin, cadmium in the urine, or cadmium in the blood, it is very important to protect the kidney from further damage. Kidney damage can come from other sources than excess cadmium-exposure so it is also recommended that if a worker's levels are "high" he/she should receive counseling about drinking more water; avoiding cadmium-tainted tobacco and certain medications (nephrotoxins, acetaminophen); controlling diet, vitamin intake, blood pressure and diabetes; etc.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07441, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07441, filed 7/20/94, effective 9/20/94; 93-21-075 (Order 93-06), § 296-62-07441, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07441, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07443 Appendix B—Substance technical guidelines for cadmium. (1) Cadmium metal.

(a) Physical and chemical data.

(i) Substance identification.

Chemical name: Cadmium.

Formula: Cd.

Molecular Weight: 112.4.

Chemical Abstracts Service (CAS) Registry No.: 7740-43-9.

Other identifiers: RETCS EU9800000; EPA D006; DOT 2570 53.

Synonyms: Colloidal Cadmium: Kadmium (German): CI 77180.

(ii) Physical data.

Boiling point: (760 mm Hg): 765 degrees C.

Melting point: 321 degrees C.

Specific gravity: ($\text{H}_2\text{O}=@ 20^\circ\text{C}$): 8.64.

Solubility: Insoluble in water; soluble in dilute nitric acid and in sulfuric acid.

Appearance: Soft, blue-white, malleable, lustrous metal or grayish-white powder.

(b) Fire, explosion, and reactivity data.

(i) Fire.

Fire and explosion hazards: The finely divided metal is pyrophoric, that is the dust is a severe fire hazard and moderate explosion hazard when exposed to heat or flame. Burning material reacts violently with extinguishing agents such as water, foam, carbon dioxide, and halons.

Flash point: Flammable (dust).

Extinguishing media: Dry sand, dry dolomite, dry graphite, or sodium chloride.

(ii) Reactivity.

Conditions contributing to instability: Stable when kept in sealed containers under normal temperatures and pressure, but dust may ignite upon contact with air. Metal tarnishes in moist air.

(iii) Incompatibilities: Ammonium nitrate, fused: Reacts violently or explosively with cadmium dust below 20°C. Hydrozoic acid: Violent explosion occurs after thirty minutes. Acids: Reacts violently, forms hydrogen gas. Oxidizing agents or metals: Strong reaction with cadmium dust. Nitryl fluoride at slightly elevated temperature: Glowing or white incandescence occurs. Selenium: Reacts exothermically. Ammonia: Corrosive reaction. Sulfur dioxide: Corrosive reaction. Fire extinguishing agents (water, foam, carbon dioxide, and halons): Reacts violently. Tellurium: Incandescent reaction in hydrogen atmosphere.

(iv) Hazardous decomposition products: The heated metal rapidly forms highly toxic, brownish fumes of oxides of cadmium.

(c) Spill, leak, and disposal procedures.

(i) Steps to be taken if the materials is released or spilled. Do not touch spilled material. Stop leak if you can do it without risk. Do not get water inside container. For large spills, dike spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry.

(ii) The Superfund Amendments and Reauthorization Act of 1986 Section 304 requires that a release equal to or greater than the reportable quantity for this substance (one pound) must be immediately reported to the local emergency planning committee, the state emergency response commission, and the National Response Center (800) 424-8802; in Washington, DC metropolitan area (202) 426-2675.

(2) Cadmium oxide.

(a) Physical and chemical data.

(i) Substance identification.

Chemical name: Cadmium oxide.

Formula: CdO.

Molecular Weight: 128.4.

CAS No.: 1306-19-0.

Other identifiers: RTECS EV1929500.

Synonyms: Kadmu tlenek (Polish).

(ii) Physical data.

Boiling point (760 mm Hg): 950 degrees C decomposes.

Melting point: 1500°C.

Specific gravity: (H₂O=1@20°C): 7.0.

Solubility: Insoluble in water; soluble in acids and alkalines.

Appearance: Red or brown crystals.

(b) Fire, explosion, and reactivity data.

(i) Fire.

Fire and explosion hazards: Negligible fire hazard when exposed to heat or flame.

Flash point: Nonflammable.

Extinguishing media: Dry chemical, carbon dioxide, water spray or foam.

(ii) Reactivity.

Conditions contributing to instability: Stable under normal temperatures and pressures.

(iii) Incompatibilities: Magnesium may reduce CdO₂ explosively on heating.

(iv) Hazardous decomposition products: Toxic fumes of cadmium.

(c) Spill, leak, and disposal procedures.

(i) Steps to be taken if the material is released or spilled. Do not touch spilled material. Stop leak if you can do it without risk. For small spills, take up with sand or other absorbent material and place into containers for later disposal. For small dry spills, use a clean shovel to place material into clean, dry container and then cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry.

(ii) The Superfund Amendments and Reauthorization Act of 1986 Section 304 requires that a release equal to or greater than the reportable quantity for this substance (one pound) must be immediately reported to the local emergency planning committee, the state emergency response commission, and the National Response Center (800) 424-8802; in Washington, DC metropolitan area (202) 426-2675.

(3) Cadmium sulfide.

(a) Physical and chemical data.

(i) Substance identification.

Chemical name: Cadmium sulfide.

Formula: CdS.

Molecular weight: 144.5.

CAS No. 1306-23-6.

Other identifiers: RTECS EV3150000.

Synonyms: Aurora yellow; Cadmium Golden 366; Cadmium Lemon Yellow 527; Cadmium Orange; Cadmium Primrose 819; Cadmium Sulphide; Cadmium Yellow; Cadmium Yellow 000; Cadmium Yellow Conc. Deep; Cadmium Yellow Conc. Golden; Cadmium Yellow Conc. Lemon; Cadmium Yellow Conc. Primrose; Cadmium Yellow Oz. Dark; Cadmium Yellow Primrose 47-1400; Cadmium Yellow 10G Conc.; Cadmium Yellow 892; Cadmopur Golden Yellow N; Cadmopur Yellow: Capsebon; C.I. 77199; C.I. Pigment Orange 20; CI Pigment Yellow 37; Ferro Lemon Yellow; Ferro Orange Yellow; Ferro Yellow; Greenockite; NCI-C02711.

(ii) Physical data.

Boiling point (760 mm. Hg): sublimes in N₂ at 980°C.

Melting point: 1750 degrees C (100 atm).

Specific gravity: (H₂O=1@ 20°C): 4.82.

Solubility: Slightly soluble in water; soluble in acid.

Appearance: Light yellow or yellow-orange crystals.

(b) Fire, explosion, and reactivity data.

(i) Fire.

Fire and explosion hazards: Negligible fire hazard when exposed to heat or flame.

Flash point: Nonflammable.

Extinguishing media: Dry chemical, carbon dioxide, water spray or foam.

(ii) Reactivity. Conditions contributing to instability: Generally nonreactive under normal conditions. Reacts with acids to form toxic hydrogen sulfide gas.

(iii) Incompatibilities: Reacts vigorously with iodine-monochloride.

(iv) Hazardous decomposition products: Toxic fumes of cadmium and sulfur oxides.

(c) Spill, leak, and disposal procedures.

(i) Steps to be taken if the material is released or spilled. Do not touch spilled material. Stop leak if you can do it without risk. For small, dry spills, with a clean shovel place material into clean, dry container and cover. Move containers from spill area.

(ii) For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard and deny entry.

(4) Cadmium chloride.

(a) Physical and chemical data.

(i) Substance identification.

Chemical name: Cadmium chloride.

Formula: CdCl₂.

Molecular weight: 183.3.

CAS No. 10108-64-2.

Other identifiers: RTECS EY0175000.

Synonyms: Caddy; Cadmium dichloride; NA 2570 (DOT); UI-CAD; dichlorocadmium.

(ii) Physical data.

Boiling point (760 mm Hg): 960 degrees C.

Melting point: 568 degrees C.

Specific gravity: (H₂O = 1 @ 20°C): 4.05.

Solubility: Soluble in water (140 g/100 cc); soluble in acetone.

Appearance: Small, white crystals.

(b) Fire, explosion, and reactivity data.

(i) Fire.

Fire and explosion hazards: Negligible fire and negligible explosion hazard in dust form when exposed to heat or flame.

Flash point: Nonflammable.

Extinguishing media: Dry chemical, carbon dioxide, water spray, or foam.

(ii) Reactivity. Conditions contributing to instability: Generally stable under normal temperatures and pressures.

(iii) Incompatibilities: Bromine trifluoride [trifluoride] rapidly attacks cadmium chloride. A mixture of potassium and cadmium chloride may produce a strong explosion on impact.

(iv) Hazardous decomposition products: Thermal decomposition may release toxic fumes of hydrogen chloride, chloride, chlorine or oxides of cadmium.

(c) Spill, leak, and disposal procedures.

(i) Steps to be taken if the materials is released or spilled. Do not touch spilled material. Stop leak if you can do it without risk. For small, dry spills, with a clean shovel place material into clean, dry container and cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard and deny entry.

(ii) The Superfund Amendments and Reauthorization Act of 1986 Section 304 requires that a release equal to or greater than the reportable quantity for this substance (one hundred pounds) must be immediately reported to the local emergency planning committee, the state emergency response commission, and the National Response Center

(800) 424-8802; in Washington, DC Metropolitan area (202) 426-2675.

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07443, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07447 Appendix D—Occupational health history interview with reference to cadmium exposure directions.

(To be read by employee and signed prior to the interview.)

Please answer the questions you will be asked as completely and carefully as you can. These questions are asked of everyone who works with cadmium. You will also be asked to give blood and urine samples. The doctor will give your employer a written opinion on whether you are physically capable of working with cadmium. Legally, the doctor cannot share personal information you may tell him/her with your employer. The following information is considered strictly confidential. The results of the tests will go to you, your doctor and your employer. You will also receive an information sheet explaining the results of any biological monitoring or physical examinations performed. If you are just being hired, the results of this interview and examination will be used to:

- (1) Establish your health status and see if working with cadmium might be expected to cause unusual problems;
- (2) Determine your health status today and see if there are changes over time;
- (3) See if you can wear a respirator safely. If you are not a new hire: WISHA says that everyone who works with cadmium can have periodic medical examinations performed by a doctor. The reasons for this are:

- (a) If there are changes in your health, either because of cadmium or some other reason, to find them early;
- (b) To prevent kidney damage.

Please sign below.

I have read these directions and understand them:

Employee signature

Date

Thank you for answering these questions. (Suggested Format)

Name.....
 Age.....
 Social Security #.....
 Company.....
 Job.....
 Type of Preplacement Exam: Periodic Termination Initial Other
 Blood Pressure.....
 Pulse Rate.....
 1. How long have you worked at the job listed above?
 Not yet hired Number of months Number of years
 2. Job Duties etc.

 3. Have you ever been told by a doctor that you had bronchitis?
 Yes No
 If yes, how long ago? Number of months Number of years
 4. Have you ever been told by a doctor that you had emphysema?
 Yes No
 If yes, how long ago? Number of years Number of months
 5. Have you ever been told by a doctor that you had other lung problems?
 Yes No
 If yes, please describe type of lung problems and when you had these problems

6. In the past year, have you had a cough? Yes No
 If yes, did you cough up sputum? Yes No
 If yes, how long did the cough with sputum production last?
 Less than 3 months 3 months or longer
 If yes, for how many years have you had episodes of cough with sputum production lasting this long?
 Less than one 1 2 Longer than 2

7. Have you ever smoked cigarettes? Yes No

8. Do you now smoke cigarettes? Yes No

9. If you smoke or have smoked cigarettes, for how many years have you smoked, or did you smoke?
 Less than 1 year Number of years
 What is or was the greatest number of packs per day that you have smoked?
 Number of packs
 If you quit smoking cigarettes, how many years ago did you quit?
 Less than 1 year Number of years
 How many packs a day do you now smoke? Number of packs per day

10. Have you ever been told by a doctor that you had a kidney or urinary tract disease or disorder? Yes No

11. Have you ever had any of these disorders?
 Kidney stones Yes No
 Protein in urine Yes No
 Blood in urine Yes No
 Difficulty urinating Yes No
 Other kidney/Urinary disorders Yes No

Please describe problems, age, treatment, and follow up for any kidney or urinary problems you have had:

12. Have you ever been told by a doctor or other health care provider who took your blood pressure that your blood pressure was high?
 Yes No

13. Have you ever been advised to take any blood pressure medication?
 Yes No

14. Are you presently taking any blood pressure medication?
 Yes No

15. Are you presently taking any other medication? Yes No

16. Please list any blood pressure or other medications and describe how long you have been taking each one:
 Medicine:

 How Long Taken

 17. Have you ever been told by a doctor that you have diabetes? (sugar in your blood or urine) Yes No
 If yes, do you presently see a doctor about your diabetes? Yes No
 If yes, how do you control your blood sugar? Diet alone
 Diet plus oral medicine Diet plus insulin (injection)

18. Have you ever been told by a doctor that you had:
 Anemia Yes No A low blood count? Yes No

19. Do you presently feel that you tire or run out of energy sooner than normal or sooner than other people your age? Yes No
 If yes, for how long have you felt that you tire easily?
 Less than 1 year Number of years

20. Have you given blood within the last year? Yes No
 If yes, how many times? Number of times
 How long ago was the last time you gave blood?
 Less than 1 month Number of months

21. Within the last year have you had any injuries with heavy bleeding?
 Yes No
 If yes, how long ago? Less than 1 month Number of months describe:

 22. Have you recently had any surgery? Yes No If yes, please describe:

23. Have you seen any blood lately in your stool or after a bowel movement?
 Yes No

24. Have you ever had a test for blood in your stool? Yes No
 If yes, did the test show any blood in the stool? Yes No
 What further evaluation and treatment were done?

The following questions pertain to the ability to wear a respirator. Additional information for the physician can be found in The Respiratory Protective Devices Manual.

25. Have you ever been told by a doctor that you have asthma?
 Yes No
 If yes, are you presently taking any medication for asthma?
 Mark all that apply. Shots Pills Inhaler

26. Have you ever had a heart attack? Yes No
 If yes, how long ago? Number of years Number of months

27. Have you ever had pains in your chest? Yes No
 If yes, when did it usually happen? While resting While working
 While exercising Activity didn't matter

28. Have you ever had a thyroid problem? Yes No

29. Have you ever had a seizure or fits? Yes No

30. Have you ever had a stroke (cerebrovascular accident)? Yes No

31. Have you ever had a ruptured eardrum or a serious hearing problem?
 Yes No

32. Do you now have a claustrophobia, meaning fear of crowded or closed in spaces or any psychological problems that would make it hard for you to wear a respirator? Yes No
 The following questions pertain to reproductive history.

33. Have you or your partner had a problem conceiving a child?
 Yes No
 If yes, specify: Self Present mate Previous mate

34. Have you or your partner consulted a physician for a fertility or other reproductive problem? Yes No
 If yes, specify who consulted the physician: Self Spouse/partner Self and partner
 If yes, specify diagnosis made:

35. Have you or your partner ever conceived a child resulting in a miscarriage, still birth or deformed offspring?
 Yes No
 If yes, specify: Miscarriage Still birth Deformed offspring
 If outcome was a deformed offspring, please specify type:

36. Was this outcome a result of a pregnancy of: Yours with present partner Yours with a previous partner

37. Did the timing of any abnormal pregnancy outcome coincide with present employment? Yes No
 List dates of occurrences:

38. What is the occupation of your spouse or partner?

 For Women Only

39. Do you have menstrual periods? Yes No
 Have you had menstrual irregularities? Yes No
 If yes, specify type:

If yes, what was the approximated date this problem began?
 Approximate date problem stopped?

For Men Only

40. Have you ever been diagnosed by a physician as having prostate gland problem(s)? Yes No
 If yes, please describe type of problem(s) and what was done to evaluate and treat the problem(s):

[Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-62-07447, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07447, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07449 Appendix E—Cadmium in workplace atmospheres.

Method number: ID-189 (OSHA); (ICP/MS) 0009 (WISHA)

Matrix: Air

WISHA permissible exposure limits: 5 µg/m³ (TWA), 2.5 µg/m³ (action level TWA)

Collection procedure: A known volume of air is drawn through a 37-mm diameter filter cassette containing a 0.8 µm mixed cellulose ester membrane filter (MCEF).

Recommended air volume: 960 L

Recommended sampling rate: 2.0 L/min

Analytical procedure: Air filter samples are digested with nitric acid. After digestion, a small amount of hydrochloric acid is added. The samples are then diluted to volume with deionized water and analyzed by either flame atomic absorption spectroscopy (AAS) or flameless atomic absorption spectroscopy using a heated graphite furnace atomizer (AAS-HGA).

Detection limits:

Qualitative: 0.2 µg/m³ for a 200 L sample by Flame AAS, 0.007 µg/m³ for a 60 L sample by AAS-HGA

Quantitative: 0.70 µg/m³ for a 200 L sample by Flame AAS, 0.025 µg/m³ for a 60 L sample by AAS-HGA

Precision and accuracy: (Flame AAS Analysis and AAS-HGA Analysis):

Validation level: 2.5 to 10 µg/m³ for a 400 L air vol, 1.25 to 5.0 µg/m³ for a 60 L air vol CV1 (pooled): 0.010, 0.043

Analytical bias: +4.0%, -5.8%

Overall analytical error: ±6.0%, ±14.2%

Method classification: Validated Date: June, 1992

Inorganic Service Branch II, OSHA Salt Lake Technical Center, Salt Lake City, Utah Commercial manufacturers and products mentioned in this method are for descriptive use only and do not constitute endorsements by USDOL-OSHA. Similar products from other sources can be substituted.

(1) Introduction.

(a) Scope.

This method describes the collection of airborne elemental cadmium and cadmium compounds on 0.8 µm mixed cellulose ester membrane filters and their subsequent analysis by either flame atomic absorption spectroscopy (AAS) or flameless atomic absorption spectroscopy using a heated graphite furnace atomizer (AAS-HGA). It is applicable for both TWA and action level TWA permissible exposure level (PEL) measurements. The two atomic absorption analytical techniques included in the method do not differentiate between cadmium fume and cadmium dust samples. They also do not differentiate between elemental cadmium and its compounds.

(b) Principle.

Airborne elemental cadmium and cadmium compounds are collected on a 0.8 µm mixed cellulose ester membrane filter (MCEF). The air filter samples are digested with concentrated nitric acid to destroy the organic matrix and dissolve the cadmium analytes. After digestion, a small amount of concentrated hydrochloric acid is added to help dissolve other metals which may be present. The samples are diluted

to volume with deionized water and then aspirated into the oxidizing air/acetylene flame of an atomic absorption spectrophotometer for analysis of elemental cadmium. If the concentration of cadmium in a sample solution is too low for quantitation by this flame AAS analytical technique, and the sample is to be averaged with other samples for TWA calculations, aliquots of the sample and a matrix modifier are later injected onto a L'vov platform in a pyrolytically-coated graphite tube of a Zeeman atomic absorption spectrophotometer/graphite furnace assembly for analysis of elemental cadmium. The matrix modifier is added to stabilize the cadmium metal and minimize sodium chloride as an interference during the high temperature charring step of the analysis subsection (5)(a) and (b) of this section.

(c) History.

Previously, two OSHA sampling and analytical methods for cadmium were used concurrently WAC 296-62-07449 (5)(c) and (d). Both of these methods also required 0.8 µm mixed cellulose ester membrane filters for the collection of air samples. These cadmium air filter samples were analyzed by either flame atomic absorption spectroscopy (subsection (5)(c) of this section) or inductively coupled plasma/atomic emission spectroscopy (ICP-AES) (subsection (5)(d) of this section). Neither of these two analytical methods have adequate sensitivity for measuring workplace exposure to airborne cadmium at the new lower TWA and action level TWA PEL levels when consecutive samples are taken on one employee and the sample results need to be averaged with other samples to determine a single TWA. The inclusion of two atomic absorption analytical techniques in the new sampling and analysis method for airborne cadmium permits quantitation of sample results over a broad range of exposure levels and sampling periods. The flame AAS analytical technique included in this method is similar to the previous procedure given in the General Metals Method ID-121 (subsection (5)(c) of this section) with some modifications. The sensitivity of the AAS-HGA analytical technique included in this method is adequate to measure exposure levels at 1/10 the action level TWA, or lower, when less than full-shift samples need to be averaged together.

(d) Properties (subsection (5)(e) of this section).

Elemental cadmium is a silver-white, blue-tinged, lustrous metal which is easily cut with a knife. It is slowly oxidized by moist air to form cadmium oxide. It is insoluble in water, but reacts readily with dilute nitric acid. Some of the physical properties and other descriptive information of elemental cadmium are given below:

CAS No	7440-43-9
Atomic Number	48
Atomic Symbol	Cd
Atomic Weight	112.41
Melting Point	321°C
Boiling Point	765°C
Density	8.65 g/mL (25°C)

The properties of specific cadmium compounds are described in reference subsection (5)(e) of this section.

(e) Method performance.

A synopsis of method performance is presented below. Further information can be found in subsection (4) of this section.

(i) The qualitative and quantitative detection limits for the flame AAS analytical technique are 0.04 μg (0.004 $\mu\text{g/mL}$) and 0.14 μg (0.014 $\mu\text{g/mL}$) cadmium, respectively, for a 10 mL solution volume. These correspond, respectively, to 0.2 $\mu\text{g/m}^3$ and 0.70 $\mu\text{g/m}^3$ for a 200 L air volume.

(ii) The qualitative and quantitative detection limits for the AAS-HGA analytical technique are 0.44 ng (0.044 ng/mL) and 1.5 ng (0.15 ng/mL) cadmium, respectively, for a 10 mL solution volume. These correspond, respectively, to 0.007 $\mu\text{g/m}^3$ and 0.025 $\mu\text{g/m}^3$ for a 60 L air volume.

(iii) The average recovery by the flame AAS analytical technique of 17 spiked MCEF samples containing cadmium in the range of 0.5 to 2.0 times the TWA target concentration of 5 $\mu\text{g/m}^3$ (assuming a 400 L air volume) was 104.0% with a pooled coefficient of variation (CV^1) of 0.010. The flame analytical technique exhibited a positive bias of +4.0% for the validated concentration range. The overall analytical error (OAE) for the flame AAS analytical technique was $\pm 6.0\%$.

(iv) The average recovery by the AAS-HGA analytical technique of 18 spiked MCEF samples containing cadmium in the range of 0.5 to 2.0 times the action level TWA target concentration of 2.5 $\mu\text{g/m}^3$ (assuming a 60 L air volume) was 94.2% with a pooled coefficient of variation (CV^1) of 0.043. The AAS-HGA analytical technique exhibited a negative bias of -5.8% for the validated concentration range. The overall analytical error (OAE) for the AAS-HGA analytical technique was $\pm 14.2\%$.

(v) Sensitivity in flame atomic absorption is defined as the characteristic concentration of an element required to produce a signal of 1% absorbance (0.0044 absorbance units). Sensitivity values are listed for each element by the atomic absorption spectrophotometer manufacturer and have proved to be a very valuable diagnostic tool to determine if instrumental parameters are optimized and if the instrument is performing up to specification. The sensitivity of the spectrophotometer used in the validation of the flame AAS analytical technique agreed with the manufacturer specifications (subsection (5)(f) of this section); the 2 $\mu\text{g/mL}$ cadmium standard gave an absorbance reading of 0.350 abs. units.

(vi) Sensitivity in graphite furnace atomic absorption is defined in terms of the characteristic mass, the number of picograms required to give an integrated absorbance value of 0.0044 absorbance-second (subsection (5)(g) of this section). Data suggests that under stabilized temperature platform furnace (STPF) conditions (see (f)(ii) of this subsection), characteristic mass values are transferable between properly functioning instruments to an accuracy of about twenty percent (subsection (5)(b) of this section). The characteristic mass for STPF analysis of cadmium with Zeeman background correction listed by the manufacturer of the instrument used in the validation of the AAS-HGA analytical technique was 0.35 pg. The experimental characteristic mass value observed during the determination of the working range and detection limits of the AAS-HGA analytical technique was 0.41 pg.

(f) Interferences.

(i) High concentrations of silicate interfere in determining cadmium by flame AAS (subsection (5)(f) of this section). However, silicates are not significantly soluble in the acid matrix used to prepare the samples.

(ii) Interferences, such as background absorption, are reduced to a minimum in the AAS-HGA analytical technique by taking full advantage of the stabilized temperature platform furnace (STPF) concept. STPF includes all of the following parameters (subsection (5)(b) of this section):

- (A) Integrated absorbance;
- (B) Fast instrument electronics and sampling frequency;
- (C) Background correction;
- (D) Maximum power heating;
- (E) Atomization off the L'vov platform in a pyrolytically coated graphite tube;
- (F) Gas stop during atomization;
- (G) Use of matrix modifiers.
- (g) Toxicology (subsection (5)(n) of this section).

Information listed within this section is synopsis of current knowledge of the physiological effects of cadmium and is not intended to be used as the basis for WISHA policy. IARC classifies cadmium and certain of its compounds as Group 2A carcinogens (probably carcinogenic to humans). Cadmium fume is intensely irritating to the respiratory tract. Workplace exposure to cadmium can cause both chronic and acute effects. Acute effects include tracheobronchitis, pneumonitis, and pulmonary edema. Chronic effects include anemia, rhinitis/anosmia, pulmonary emphysema, proteinuria and lung cancer. The primary target organs for chronic disease are the kidneys (noncarcinogenic) and the lungs (carcinogenic).

(2) Sampling.

(a) Apparatus.

(i) Filter cassette unit for air sampling: A 37-mm diameter mixed cellulose ester membrane filter with a pore size of 0.8 μm contained in a 37-mm polystyrene two- or three-piece cassette filter holder (part no. MAWP 037 A0, Millipore Corp., Bedford, MA). The filter is supported with a cellulose backup pad. The cassette is sealed prior to use with a shrinkable gel band.

(ii) A calibrated personal sampling pump whose flow is determined to an accuracy of $\pm 5\%$ at the recommended flow rate with the filter cassette unit in line.

(b) Procedure

(i) Attach the prepared cassette to the calibrated sampling pump (the backup pad should face the pump) using flexible tubing. Place the sampling device on the employee such that air is sampled from the breathing zone.

(ii) Collect air samples at a flow rate of 2.0 L/min. If the filter does not become overloaded, a full-shift (at least seven hours) sample is strongly recommended for TWA and action level TWA measurements with a maximum air volume of 960 L. If overloading occurs, collect consecutive air samples for shorter sampling periods to cover the full workshift.

(iii) Replace the end plugs into the filter cassettes immediately after sampling. Record the sampling conditions.

(iv) Securely wrap each sample filter cassette end-to-end with a sample seal.

(v) Submit at least one blank sample. With each set of air samples. The blank sample should be handled the same as the other samples except that no air is drawn through it.

(vi) Ship the samples to the laboratory for analysis as soon as possible in a suitable container designed to prevent damage in transit.

(3) Analysis.

(a) Safety precautions.

(i) Wear safety glasses, protective clothing and gloves at all times.

(ii) Handle acid solutions with care. Handle all cadmium samples and solutions with extra care (see subsection (1)(g) of this section). Avoid their direct contact with work area surfaces, eyes, skin and clothes. Flush acid solutions which contact the skin or eyes with copious amounts of water.

(iii) Perform all acid digestions and acid dilutions in an exhaust hood while wearing a face shield. To avoid exposure to acid vapors, do not remove beakers containing concentrated acid solutions from the exhaust hood until they have returned to room temperature and have been diluted or emptied.

(iv) Exercise care when using laboratory glassware. Do not use chipped pipets, volumetric flasks, beakers or any glassware with sharp edges exposed in order to avoid the possibility of cuts or abrasions.

(v) Never pipet by mouth.

(vi) Refer to the instrument instruction manuals and SOPs (subsection (5)(h) and (i) of this section) for proper and safe operation of the atomic absorption spectrophotometer, graphite furnace atomizer and associated equipment.

(vii) Because metallic elements and other toxic substances are vaporized during AAS flame or graphite furnace atomizer operation, it is imperative that an exhaust vent be used. Always ensure that the exhaust system is operating properly during instrument use.

(b) Apparatus for sample and standard preparation.

(i) Hot plate, capable of reaching 150°C, installed in an exhaust hood.

(ii) Phillips beakers, 125 mL.

(iii) Bottles, narrow-mouth, polyethylene or glass with leakproof caps: used for storage of standards and matrix modifier.

(iv) Volumetric flasks, volumetric pipets, beakers and other associated general laboratory glassware.

(v) Forceps and other associated general laboratory equipment.

(c) Apparatus for flame AAS analysis.

(i) Atomic absorption spectrophotometer consisting of a(an):

Nebulizer and burner head; pressure regulating devices capable of maintaining constant oxidant and fuel pressures; optical system capable of isolating the desired wavelength of radiation (228.8 nm); adjustable slit; light measuring and amplifying device; display, strip chart, or computer interface for indicating the amount of absorbed radiation; cadmium hollow cathode lamp or electrodeless discharge lamp (EDL) and power supply.

(ii) Oxidant: Compressed air, filtered to remove water, oil and other foreign substances.

(iii) Fuel: Standard commercially available tanks of acetylene dissolved in acetone; tanks should be equipped with flash arresters.

Caution: Do not use grades of acetylene containing solvents other than acetone because they may damage the PVC tubing used in some instruments.

(iv) Pressure-reducing valves: Two gauge, two-stage pressure regulators to maintain fuel and oxidant pressures somewhat higher than the controlled operating pressures of the instrument.

(v) Exhaust vent installed directly above the spectrophotometer burner head.

(d) Apparatus for AAS-HGA analysis.

(i) Atomic absorption spectrophotometer consisting of a(an):

Heated graphite furnace atomizer (HGA) with argon purge system pressure-regulating devices capable of maintaining constant argon purge pressure; optical system capable of isolating the desired wavelength of radiation (228.8 nm); adjustable slit; light measuring and amplifying device; display, strip chart, or computer interface for indicating the amount of absorbed radiation (as integrated absorbance, peak area); background corrector: Zeeman or deuterium arc. The Zeeman background corrector is recommended; cadmium hollow cathode lamp or electrodeless discharge lamp (EDL) and power supply; autosampler capable of accurately injecting 5 to 20 μ L sample aliquots onto the L'vov Platform in a graphite tube.

(ii) Pyrolytically coated graphite tubes containing solid, pyrolytic L'vov platforms.

(iii) Polyethylene sample cups, 2.0 to 2.5 mL, for use with the autosampler.

(iv) Inert purge gas for graphite furnace atomizer: Compressed gas cylinder of purified argon.

(v) Two gauge, two-stage pressure regulator for the argon gas cylinder.

(vi) Cooling water supply for graphite furnace atomizer.

(vii) Exhaust vent installed directly above the graphite furnace atomizer.

(e) Reagents. All reagents should be ACS analytical reagent grade or better.

(i) Deionized water with a specific conductance of less than 10 μ S.

(ii) Concentrated nitric acid, HNO₃.

(iii) Concentrated hydrochloric acid, HCl.

(iv) Ammonium phosphate, monobasic, NH₄H₂PO₄.

(v) Magnesium nitrate, Mg(NO₃)₂ • 6H₂O.

(vi) Diluting solution (4% HNO₃, 0.4% HCl): Add 40 mL HNO₃ and 4 mL HCl carefully to approximately 500 mL deionized water and dilute to 1 L with deionized water.

(vii) Cadmium standard stock solution, 1,000 μ g/mL: Use a commercially available certified 1,000 μ g/mL cadmium standard or, alternatively, dissolve 1.0000 g of cadmium metal in a minimum volume of 1:1 HCl and dilute to 1 L with 4% HNO₃. Observe expiration dates of commercial standards. Properly dispose of commercial standards with no expiration dates or prepared standards one year after their receipt or preparation date.

(viii) Matrix modifier for AAS-HGA analysis: Dissolve 1.0 g NH₄H₂PO₄ and 0.15 g Mg(NO₃)₂ • 6H₂O in approximately 200 mL deionized water. Add 1 mL HNO₃ and dilute to 500 mL with deionized water.

(ix) Nitric Acid, 1:1 HNO₃/DI H₂O mixture: Carefully add a measured volume of concentrated HNO₃ to an equal volume of DI H₂O.

(x) Nitric acid, 10% v/v: Carefully add 100 mL of concentrated HNO₃ to 500 mL of DI H₂O and dilute to 1 L.

(f) Glassware preparation.

(i) Clean Phillips beakers by refluxing with 1:1 nitric acid on a hot plate in a fume hood. Thoroughly rinse with deionized water and invert the beakers to allow them to drain dry.

(ii) Rinse volumetric flasks and all other glassware with 10% nitric acid and deionized water prior to use.

(g) Standard preparation for flame AAS analysis.

(i) Dilute stock solutions: Prepare 1, 5, 10 and 100 µg/mL cadmium standard stock solutions by making appropriate serial dilutions of 1,000 µg/mL cadmium standard stock solution with the diluting solution described in (e)(vi) of this subsection.

(ii) Working standards: Prepare cadmium working standards in the range of 0.02 to 2.0 µg/mL by making appropriate serial dilutions of the dilute stock solutions with the same diluting solution. A suggested method of preparation of the working standards is given below.

Working standard (µg/mL)	Std solution (µg/mL)	Aliquot (mL)	Final vol. (mL)
0.02	1	10	500
0.05	5	5	500
0.1	10	5	500
0.2	10	10	500
0.5	10	25	500
1	100	5	500
2	100	10	500

Store the working standards in 500-mL, narrow-mouth polyethylene or glass bottles with leak proof caps. Prepare every twelve months.

(h) Standard preparation for AAS-HGA analysis.

(i) Dilute stock solutions: Prepare 10, 100 and 1,000 ng/mL cadmium standard stock solutions by making appropriate ten-fold serial dilutions of the 1,000 µg/mL cadmium standard stock solution with the diluting solution described in (e)(vi) of this subsection.

(ii) Working standards: Prepare cadmium working standards in the range of 0.2 to 20 ng/mL by making appropriate serial dilutions of the dilute stock solutions with the same diluting solution. A suggested method of preparation of the working standards is given below.

Working standard (ng/mL)	Std solution (ng/mL)	Aliquot (mL)	Final vol. (mL)
0.2	10	2	100
0.5	10	5	100
1	10	10	100
2	100	2	100

Working standard (ng/mL)	Std solution (ng/mL)	Aliquot (mL)	Final vol. (mL)
5	100	5	100
10	100	10	100
20	1,000	2	100

Store the working standards in narrow-mouth polyethylene or glass bottles with leakproof caps. Prepare monthly.

(i) Sample preparation.

(i) Carefully transfer each sample filter with forceps from its filter cassette unit to a clean, separate 125-mL Phillips beaker along with any loose dust found in the cassette. Label each Phillips beaker with the appropriate sample number.

(ii) Digest the sample by adding 5 mL of concentrated nitric acid (HNO₃) to each Phillips beaker containing an air filter sample. Place the Phillips beakers on a hot plate in an exhaust hood and heat the samples until approximately 0.5 mL remains. The sample solution in each Phillips beaker should become clear. If it is not clear, digest the sample with another portion of concentrated nitric acid.

(iii) After completing the HNO₃ digestion and cooling the samples, add 40 µL (2 drops) of concentrated HCl to each air sample solution and then swirl the contents. Carefully add about 5 mL of deionized water by pouring it down the inside of each beaker.

(iv) Quantitatively transfer each cooled air sample solution from each Phillips beaker to a clean 10-mL volumetric flask. Dilute each flask to volume with deionized water and mix well.

(j) Flame AAS analysis.

Analyze all of the air samples for their cadmium content by flame atomic absorption spectroscopy (AAS) according to the instructions given below.

(i) Set up the atomic absorption spectrophotometer for the air/acetylene flame analysis of cadmium according to the SOP (subsection (5)(h) of this section) or the manufacturer's operational instructions. For the source lamp, use the cadmium hollow cathode or electrodeless discharge lamp operated at the manufacturer's recommended rating for continuous operation. Allow the lamp to warm up ten to twenty minutes or until the energy output stabilizes. Optimize conditions such as lamp position, burner head alignment, fuel and oxidant flow rates, etc. See the SOP or specific instrument manuals for details. Instrumental parameters for the Perkin-Elmer Model 603 used in the validation of this method are given in subsection (6) of this section.

(ii) Aspirate and measure the absorbance of a standard solution of cadmium. The standard concentration should be within the linear range. For the instrumentation used in the validation of this method a 2 µg/mL cadmium standard gives a net absorbance reading of about 0.350 abs. units (see subsection (1)(e)(v) of this section) when the instrument and the source lamp are performing to manufacturer specifications.

(iii) To increase instrument response, scale expand the absorbance reading of the aspirated 2 µg/mL working standard approximately four times. Increase the integration time to at least three seconds to reduce signal noise.

(iv) Autozero the instrument while aspirating a deionized water blank. Monitor the variation in the baseline absorbance reading (baseline noise) for a few minutes to insure that the instrument, source lamp and associated equipment are in good operating condition.

(v) Aspirate the working standards and samples directly into the flame and record their absorbance readings. Aspirate the deionized water blank immediately after every standard or sample to correct for and monitor any baseline drift and noise. Record the baseline absorbance reading of each deionized water blank. Label each standard and sample reading and its accompanying baseline reading.

(vi) It is recommended that the entire series of working standards be analyzed at the beginning and end of the analysis of a set of samples to establish a concentration-response curve, ensure that the standard readings agree with each other and are reproducible. Also, analyze a working standard after every five or six samples to monitor the performance of the spectrophotometer. Standard readings should agree within ± 10 to 15% of the readings obtained at the beginning of the analysis.

(vii) Bracket the sample readings with standards during the analysis. If the absorbance reading of a sample is above the absorbance reading of the highest working standard, dilute the sample with diluting solution and reanalyze. Use the appropriate dilution factor in the calculations.

(viii) Repeat the analysis of approximately ten percent of the samples for a check of precision.

(ix) If possible, analyze quality control samples from an independent source as a check on analytical recovery and precision.

(x) Record the final instrument settings at the end of the analysis. Date and label the output.

(k) AAS-HGA analysis.

Initially analyze all of the air samples for their cadmium content by flame atomic absorption spectroscopy (AAS) according to the instructions given in (j) of this subsection. If the concentration of cadmium in a sample solution is less than three times the quantitative detection limit (0.04 $\mu\text{g/mL}$ (40 ng/mL) for the instrumentation used in the validation) and the sample results are to be averaged with other samples for TWA calculations, proceed with the AAS-HGA analysis of the sample as described below.

(i) Set up the atomic absorption spectrophotometer and HGA for flameless atomic absorption analysis of cadmium according to the SOP (subsection (5)(i) of this section) or the manufacturer's operational instructions and allow the instrument to stabilize. The graphite furnace atomizer is equipped with a pyrolytically coated graphite tube containing a pyrolytic platform. For the source lamp, use a cadmium hollow cathode or electrodeless discharge lamp operated at the manufacturer's recommended setting for graphite furnace operation. The Zeeman background corrector and EDL are recommended for use with the L'vov platform. Instrumental parameters for the Perkin-Elmer Model 5100 spectrophotometer and Zeeman HGA-600 graphite furnace used in the validation of this method are given in subsection (7) of this section.

(ii) Optimize the energy reading of the spectrophotometer at 228.8 nm by adjusting the lamp position and the wavelength according to the manufacturer's instructions.

(iii) Set up the autosampler to inject a 5- μL aliquot of the working standard, sample or reagent blank solution onto the L'vov platform along with a 10- μL overlay of the matrix modifier.

(iv) Analyze the reagent blank (diluting solution, (e)(vi) of this subsection) and then autozero the instrument before starting the analysis of a set of samples. It is recommended that the reagent blank be analyzed several times during the analysis to assure the integrated absorbance (peak area) reading remains at or near zero.

(v) Analyze a working standard approximately midway in the linear portion of the working standard range two or three times to check for reproducibility and sensitivity (see subsection (1)(e)(v) and (vi) of this section) before starting the analysis of samples. Calculate the experimental characteristic mass value from the average integrated absorbance reading and injection volume of the analyzed working standard. Compare this value to the manufacturer's suggested value as a check of proper instrument operation.

(vi) Analyze the reagent blank, working standard, and sample solutions. Record and label the peak area (abs-sec) readings and the peak and background peak profiles on the printer/plotter.

(vii) It is recommended the entire series of working standards be analyzed at the beginning and end of the analysis of a set of samples. Establish a concentration-response curve and ensure standard readings agree with each other and are reproducible. Also, analyze a working standard after every five or six samples to monitor the performance of the system. Standard readings should agree within $\pm 15\%$ of the readings obtained at the beginning of the analysis.

(viii) Bracket the sample readings with standards during the analysis. If the peak area reading of a sample is above the peak area reading of the highest working standard, dilute the sample with the diluting solution and reanalyze. Use the appropriate dilution factor in the calculations.

(ix) Repeat the analysis of approximately ten percent of the samples for a check of precision.

(x) If possible, analyze quality control samples from an independent source as a check of analytical recovery and precision.

(xi) Record the final instrument settings at the end of the analysis. Date and label the output.

(l) Calculations.

Note: Standards used for HGA analysis are in ng/mL . Total amounts of cadmium from calculations will be in ng (not μg) unless a prior conversion is made.

(i) Correct for baseline drift and noise in flame AAS analysis by subtracting each baseline absorbance reading from its corresponding working standard or sample absorbance reading to obtain the net absorbance reading for each standard and sample.

(ii) Use a least squares regression program to plot a concentration-response curve of net absorbance reading (or peak area for HGA analysis) versus concentration ($\mu\text{g/mL}$ or ng/mL) of cadmium in each working standard.

(iii) Determine the concentration ($\mu\text{g/mL}$ or ng/mL) of cadmium in each sample from the resulting concentration-response curve. If the concentration of cadmium in a sample

solution is less than three times the quantitative detection limit (0.04 µg/mL (40 ng/mL) for the instrumentation used in the validation of the method) and if consecutive samples were taken on one employee and the sample results are to be averaged with other samples to determine a single TWA, reanalyze the sample by AAS-HGA as described in (k) of this subsection and report the AAS-HGA analytical results.

(iv) Calculate the total amount (µg or ng) of cadmium in each sample from the sample solution volume (mL):

$$W=(C)(\text{sample vol, mL})(DF)$$

Where: W=Total cadmium in sample
C=Calculated concentration of cadmium
DF=Dilution Factor (if applicable)

(v) Make a blank correction for each air sample by subtracting the total amount of cadmium in the corresponding blank sample from the total amount of cadmium in the sample.

(vi) Calculate the concentration of cadmium in an air sample (mg/m³ or µg/m³) by using one of the following equations:

$$\text{mg/m}^3=W_{bc}/(\text{Air vol sampled, L})$$

or

$$\mu\text{g/m}^3=(W_{bc})(1,000 \text{ ng}/\mu\text{g})/(\text{Air vol sampled, L})$$

Where: W_{bc}=blank corrected total µg cadmium in the sample.
(1 µg=1,000 ng)

(4) Backup data.

(a) Introduction.

(i) The purpose of this evaluation is to determine the analytical method recovery, working standard range, and qualitative and quantitative detection limits of the two atomic absorption analytical techniques included in this method. The evaluation consisted of the following experiments:

(A) An analysis of twenty-four samples (six samples each at 0.1, 0.5, 1 and 2 times the TWA-PEL) for the analytical method recovery study of the flame AAS analytical technique.

(B) An analysis of eighteen samples (six samples each at 0.5, 1 and 2 times the action level TWA-PEL) for the analytical method recovery study of the AAS-HGA analytical technique.

(C) Multiple analyses of the reagent blank and a series of standard solutions to determine the working standard range and the qualitative and quantitative detection limits for both atomic absorption analytical techniques.

(ii) The analytical method recovery results at all test levels were calculated from concentration-response curves and statistically examined for outliers at the ninety-nine percent confidence level. Possible outliers were determined using the Treatment of Outliers test (subsection (5)(j) of this section). In addition, the sample results of the two analytical techniques, at 0.5, 1.0 and 2.0 times their target concentrations, were tested for homogeneity of variances also at the ninety-nine percent confidence level. Homogeneity of the coefficients of variation was determined using the Bartlett's test (subsection (5)(k) of this section). The overall analytical error (OAE) at the ninety-five percent confidence level was calculated using the equation (subsection (5)(l) of this section):

$$\text{OAE}=\pm[|\text{Bias}|+(1.96)(\text{CV}_i(\text{pooled}))(100\%)]$$

(iii) A derivation of the International Union of Pure and Applied Chemistry (IUPAC) detection limit equation (subsection (5)(m) of this section) was used to determine the qualitative and quantitative detection limits for both atomic absorption analytical techniques:

$$C_{ld}=k(\text{sd})/m \quad (\text{Equation 1})$$

Where: C_{ld}=the smallest reliable detectable concentration an analytical instrument can determine at a given confidence level.
k=3 for the Qualitative Detection Limit at the 99.86% Confidence Level
=10 for the Quantitative Detection Limit at the 99.99% Confidence Level.
sd=standard deviation of the reagent blank (Rbl) readings.
m=analytical sensitivity or slope as calculated by linear regression.

(iv) Collection efficiencies of metallic fume and dust atmospheres on 0.8-µm mixed cellulose ester membrane filters are well documented and have been shown to be excellent (subsection (5)(k) of this section). Since elemental cadmium and the cadmium component of cadmium compounds are nonvolatile, stability studies of cadmium spiked MCEF samples were not performed.

(b) Equipment.

(i) A Perkin-Elmer (PE) Model 603 spectrophotometer equipped with a manual gas control system, a stainless steel nebulizer, a burner mixing chamber, a flow spoiler and a 10 cm (one-slot) burner head was used in the experimental validation of the flame AAS analytical technique. A PE cadmium hollow cathode lamp, operated at the manufacturer's recommended current setting for continuous operation (4 mA), was used as the source lamp. Instrument parameters are listed in subsection (6) of this section.

(ii) A PE Model 5100 spectrophotometer, Zeeman HGA-600 graphite furnace atomizer and AS-60 HGA autosampler were used in the experimental validation of the AAS-HGA analytical technique. The spectrophotometer was equipped with a PE Series 7700 professional computer and Model PR-310 printer. A PE System 2 cadmium electrodeless discharge lamp, operated at the manufacturer's recommended current setting for modulated operation (170 mA), was used as the source lamp. Instrument parameters are listed in subsection (7) of this section.

(c) Reagents.

(i) J.T. Baker Chem. Co. (Analyzed grade) concentrated nitric acid, 69.0-71.0%, and concentrated hydrochloric acid, 36.5-38.0%, were used to prepare the samples and standards.

(ii) Ammonium phosphate, monobasic, NH₄H₂PO₄ and magnesium nitrate hexahydrate, Mg(NO₃)₂·6 H₂O both manufactured by the Mallinckrodt Chem. Co., were used to prepare the matrix modifier for AAS-HGA analysis.

(d) Standard preparation for flame AAS analysis.

(i) Dilute stock solutions: Prepared 0.01, 0.1, 1, 10 and 100 µg/mL cadmium standard stock solutions by making appropriate serial dilutions of a commercially available 1,000 µg/mL cadmium standard stock solution (RICCA Chemical Co., Lot# A102) with the diluting solution (4% HNO₃, 0.4% HCl).

(ii) Analyzed standards: Prepared cadmium standards in the range of 0.001 to 2.0 µg/mL by pipetting 2 to 10 mL of the appropriate dilute cadmium stock solution into a 100-mL volumetric flask and diluting to volume with the diluting solution. (See subsection (3)(g)(ii) of this section).

(e) Standard preparation for AAS-HGA analysis.

(i) Dilute stock solutions: Prepared 1, 10, 100 and 1,000 ng/mL cadmium standard stock solutions by making appropriate serial dilutions of a commercially available 1,000 µg/mL cadmium standard stock solution (J.T. Baker Chemical Co., Instra-analyzed, Lot# D22642) with the diluting solution (4% HNO₃, 0.4% HCl).

(ii) Analyzed standards: Prepared cadmium standards in the range of 0.1 to 40 ng/mL by pipetting 2 to 10 mL of the appropriate dilute cadmium stock solution into a 100-mL volumetric flask and diluting to volume with the diluting solution. (See subsection (3)(h)(ii) of this section).

(f) Detection limits and standard working range for flame AAS analysis.

(i) Analyzed the reagent blank solution and the entire series of cadmium standards in the range of 0.001 to 2.0 µg/mL three to six times according to the instructions given in subsection (3)(j) of this section. The diluting solution (4% HNO₃, 0.4% HCl) was used as the reagent blank. The integration time on the PE 603 spectrophotometer was set to 3.0 seconds and a four-fold expansion of the absorbance reading of the 2.0 µg/mL cadmium standard was made prior to analysis. The 2.0 µg/mL standard gave a net absorbance reading of 0.350 abs. units prior to expansion in agreement with the manufacturer's specifications (subsection (5)(f) of this section).

(ii) The net absorbance readings of the reagent blank and the low concentration Cd standards from 0.001 to 0.1 µg/mL and the statistical analysis of the results are shown in Table 1. The standard deviation, *sd*, of the six net absorbance readings of the reagent blank is 1.05 abs. units. The slope, *m*, as calculated by a linear regression plot of the net absorbance readings (shown in Table 2) of the 0.02 to 1.0 µg/mL cadmium standards versus their concentration is 772.7 abs. units/(µg/mL).

(iii) If these values for *sd* and the slope, *m*, are used in Eqn. 1 ((a)(ii) of this subsection), the qualitative and quantitative detection limits as determined by the IUPAC Method are:

$$C_{ld} = (3)(1.05 \text{ abs. units}) / (772.7 \text{ abs. units}/(\mu\text{g/mL})) = 0.0041 \mu\text{g/mL}$$

for the qualitative detection limit.

$$C_{ld} = (10)(1.05 \text{ abs. units}) / (772.7 \text{ abs. units}/(\mu\text{g/mL})) = 0.014 \mu\text{g/mL}$$

for the quantitative detection limit.

The qualitative and quantitative detection limits for the flame AAS analytical technique are 0.041 µg and 0.14 µg cadmium, respectively, for a 10 mL solution volume. These correspond, respectively, to 0.2 µg/m³ and 0.70 µg/m³ for a 200 L air volume.

(iv) The recommended Cd standard working range for flame AAS analysis is 0.02 to 2.0 µg/mL. The net absorbance readings of the reagent blank and the recommended working range standards and the statistical analysis of the results are shown in Table 2. The standard of lowest concentration in the

working range, 0.02 µg/mL, is slightly greater than the calculated quantitative detection limit, 0.014 µg/mL. The standard of highest concentration in the working range, 2.0 µg/mL, is at the upper end of the linear working range suggested by the manufacturer (subsection (5)(f) of this section). Although the standard net absorbance readings are not strictly linear at concentrations above 0.5 µg/mL, the deviation from linearity is only about ten percent at the upper end of the recommended standard working range. The deviation from linearity is probably caused by the four-fold expansion of the signal suggested in the method. As shown in Table 2, the precision of the standard net absorbance readings are excellent throughout the recommended working range; the relative standard deviations of the readings range from 0.009 to 0.064.

(g) Detection limits and standard working range for AAS-HGA analysis.

(i) Analyzed the reagent blank solution and the entire series of cadmium standards in the range of 0.1 to 40 ng/mL according to the instructions given in subsection (3)(k) of this section. The diluting solution (4% HNO₃, 0.4% HCl) was used as the reagent blank. A fresh aliquot of the reagent blank and of each standard was used for every analysis. The experimental characteristic mass value was 0.41 pg, calculated from the average peak area (abs-sec) reading of the 5 ng/mL standard which is approximately midway in the linear portion of the working standard range. This agreed within twenty percent with the characteristic mass value, 0.35 pg, listed by the manufacturer of the instrument (subsection (5)(b) of this section).

(ii) The peak area (abs-sec) readings of the reagent blank and the low concentration Cd standards from 0.1 to 2.0 ng/mL and statistical analysis of the results are shown in Table 3. Five of the reagent blank peak area readings were zero and the sixth reading was 1 and was an outlier. The near lack of a blank signal does not satisfy a strict interpretation of the IUPAC method for determining the detection limits. Therefore, the standard deviation of the six peak area readings of the 0.2 ng/mL cadmium standard, 0.75 abs-sec, was used to calculate the detection limits by the IUPAC method. The slope, *m*, as calculated by a linear regression plot of the peak area (abs-sec) readings (shown in Table 4) of the 0.2 to 10 ng/mL cadmium standards versus their concentration is 51.5 abs-sec/(ng/mL).

(iii) If 0.75 abs-sec (*sd*) and 51.5 abs-sec/(ng/mL) (*m*) are used in Eqn. 1 ((a)(iii) of this subsection), the qualitative and quantitative detection limits as determined by the IUPAC method are:

$$C_{ld} = (3)(0.75 \text{ abs-sec}) / (51.5 \text{ abs-sec}/(\text{ng/mL})) = 0.044 \text{ ng/mL}$$

for the qualitative detection limit.

$$C_{ld} = (10)(0.75 \text{ abs-sec}) / (51.5 \text{ abs-sec}/(\text{ng/mL})) = 0.15 \text{ ng/mL}$$

for the quantitative detection limit. The qualitative and quantitative detection limits for the AAS-HGA analytical technique are 0.44 ng and 1.5 ng cadmium, respectively, for a 10 mL solution volume. These correspond, respectively, to 0.007 µg/m³ and 0.025 µg/m³ for a 60 L air volume.

(iv) The peak area (abs-sec) readings of the Cd standards from 0.2 to 40 ng/mL and the statistical analysis of the results are given in Table 4. The recommended standard working range for AAS-HGA analysis is 0.2 to 20 ng/mL. The standard of lowest concentration in the recommended working

range is slightly greater than the calculated quantitative detection limit, 0.15 ng/mL. The deviation from linearity of the peak area readings of the 20 ng/mL standard, the highest concentration standard in the recommended working range, is approximately ten percent. The deviations from linearity of the peak area readings of the thirty and forty ng/mL standards are significantly greater than ten percent. As shown in Table 4, the precision of the peak area readings are satisfactory throughout the recommended working range; the relative standard deviations of the readings range from 0.025 to 0.083.

(h) Analytical method recovery for flame AAS analysis.

(i) Four sets of spiked MCEF samples were prepared by injecting 20 μL of 10, 50, 100 and 200 $\mu\text{g/mL}$ dilute cadmium stock solutions on 37 mm diameter filters (part No. AAWP 037 00, Millipore Corp., Bedford, MA) with a calibrated micropipet. The dilute stock solutions were prepared by making appropriate serial dilutions of a commercially available 1,000 $\mu\text{g/mL}$ cadmium standard stock solution (RICCA Chemical Co., Lot # A102) with the diluting solution (4% HNO_3 , 0.4% HCl). Each set contained six samples and a sample blank. The amount of cadmium in the prepared sets were equivalent to 0.1, 0.5, 1.0 and 2.0 times the TWA PEL target concentration of 5 $\mu\text{g/m}^3$ for a 400 L air volume.

(ii) The air-dried spiked filters were digested and analyzed for their cadmium content by flame atomic absorption spectroscopy (AAS) following the procedure described in subsection (3) of this section. The 0.02 to 2.0 $\mu\text{g/mL}$ cadmium standards (the suggested working range) were used in the analysis of the spiked filters.

(iii) The results of the analysis are given in Table 5. One result at 0.5 times the TWA PEL target concentration was an outlier and was excluded from statistical analysis. Experimental justification for rejecting it is that the outlier value was probably due to a spiking error. The coefficients of variation for the three test levels at 0.5 to 2.0 times the TWA PEL target concentration passed the Bartlett's test and were pooled.

(iv) The average recovery of the six spiked filter samples at 0.1 times the TWA PEL target concentration was 118.2% with a coefficient of variation (CV1) of 0.128. The average recovery of the spiked filter samples in the range of 0.5 to 2.0 times the TWA target concentration was 104.0% with a pooled coefficient of variation (CV1) of 0.010. Consequently, the analytical bias found in these spiked sample results over the tested concentration range was +4.0% and the OAE was $\pm 6.0\%$.

(i) Analytical method recovery for AAS-HGA analysis.

(i) Three sets of spiked MCEF samples were prepared by injecting 15 μL of 5, 10 and 20 $\mu\text{g/mL}$ dilute cadmium stock solutions on 37 mm diameter filters (part no. AAWP 037 00, Millipore Corp., Bedford, MA) with a calibrated micropipet. The dilute stock solutions were prepared by making appropriate serial dilutions of a commercially available certified 1,000 $\mu\text{g/mL}$ cadmium standard stock solution (Fisher Chemical Co., Lot# 913438-24) with the diluting solution (4% HNO_3 , 0.4% HCl). Each set contained six samples and a sample blank. The amount of cadmium in the prepared sets

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were equivalent to 0.5, 1 and 2 times the action level TWA target concentration of 2.5 $\mu\text{g/m}^3$ for a 60 L air volume.

(ii) The air-dried spiked filters were digested and analyzed for their cadmium content by flameless atomic absorption spectroscopy using a heated graphite furnace atomizer following the procedure described in subsection (3) of this section. A five-fold dilution of the spiked filter samples at 2 times the action level TWA was made prior to their analysis. The 0.05 to 20 ng/mL cadmium standards were used in the analysis of the spiked filters.

(iii) The results of the analysis are given in Table 6. There were no outliers. The coefficients of variation for the three test levels at 0.5 to 2.0 times the action level TWA PEL passed the Bartlett's test and were pooled. The average recovery of the spiked filter samples was 94.2% with a pooled coefficient of variation (CV1) of 0.043. Consequently, the analytical bias was -5.8% and the OAE was $\pm 14.2\%$.

(j) Conclusions.

The experiments performed in this evaluation show the two atomic absorption analytical techniques included in this method to be precise and accurate and have sufficient sensitivity to measure airborne cadmium over a broad range of exposure levels and sampling periods.

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Table 1—Cd Detection Limit Study [Flame AAS Analysis]

STD (µg/mL)	Absorbance reading at 228.8 nm	Statistical analysis
Reagent blank	5 2 4 3 4 3	n=6. mean=3.50. std dev=1.05. CV=0.30.
0.001	6 6 2 4 6 6	n=6. mean=5.00. std dev=1.67. CV=0.335.
0.002	5 7 7 3 7 4	n=6. mean=5.50. std dev=1.76. CV=0.320.
0.005	7 7 8 8 8 6	n=6. mean=7.33. std dev=0.817. CV=0.111.
0.010	10 9 10 13 10 10	n=6. mean=10.3. std dev=1.37. CV=0.133.
0.020	20 23 20 22 20 20	n=6. mean=20.8. std dev=1.33. CV=0.064.
0.050	42 42 42 42 42 45	n=6. mean=42.5. std dev=1.22.

STD (µg/mL)	Absorbance reading at 228.8 nm	Statistical analysis
0.10	84 80 83	CV=0.029. n=3. mean=82.3. std dev=2.08. CV=0.025.

Table 2—Cd Standard Working Range Study [Flame AAS Analysis]

STD(µg/mL)	Absorbance reading at 228.8 nm	Statistical analysis
Reagent blank	5 2 4 3 4 3	n=6. mean=3.50. std dev=1.05. CV=0.30.
0.020	20 23 20 22 20 20	n=6. mean=20.8. std dev=1.33.
0.050	42 42 42 42 42 45	n=6. mean=42.5. std dev=1.22. CV=0.029.
0.10	84 80 83	n=3. mean=82.3. std dev=2.08. CV=0.025.
0.20	161 161 158	n=3. mean=160.0. std dev=1.73. CV=0.011.
0.50	391 389 393	n=3. mean=391.0. std dev=2.00. CV=0.005.
1.00	760 748 752	n=3. mean=753.3. std dev=6.11. CV=0.008.
2.00	1416 1426 1401	n=3. mean=1414.3. std dev=12.6. CV=0.009.

Table 3—Cd Detection Limit Study [AAS-HGA Analysis]

STD (ng/mL)	Peak area readings x 10 ³ at 228.8 nm	Statistical analysis
Reagent blank	0 0 0 1 0 0	n=6. mean=0.167. std dev=0.41. CV=2.45.
0.1	8 6 5 7	n=6. mean=7.7.

STD (ng/mL)	Peak area readings x 10 ³ at 228.8 nm	Statistical analysis
	13 7	std dev=2.8. CV=0.366.
0.2	11 13 11 12 12 12	n=6. mean=11.8. std dev=0.75. CV=0.064.
0.5	28 33 26 28 28 30	n=6. mean=28.8. std dev=2.4. CV=0.083.
1.0	52 55 56 58 54 54	n=6. mean=54.8. std dev=2.0. CV=0.037.
2.0	101 112 110 110 110 110	n=6. mean=108.8. std dev=3.9. CV=0.036.

Table 4—Cd Standard Working Range Study [AAS-HGA Analysis]

STD (ng/mL)	Peak area readings x 10 ³ at 228.8 nm	Statistical analysis
0.2	11 13 11 12 12 12	n=6. mean=11.8. std dev=0.75. CV=0.064.
0.5	28 33 26 28 28 30	n=6. mean=28.8. std dev=2.4. CV=0.083.
1.0	52 55 56 58 54 54	n=6. mean=54.8. std dev=2.0. CV=0.037.
2.0	101 112 110 110 110 110	n=6. mean=108.8. std dev=3.9. CV=0.036.
5.0	247 265 268 275 259 279	n=6. mean=265.5. std dev=11.5. CV=0.044.
10.0	495 520 523 513 516 533	n=6. mean=516.7. std dev=12.7. CV=0.025.
20.0	950 953 951 958 949 890	n=6. mean=941.8. std dev=25.6. CV=0.027.
30.0	1269 1291 1303 1307 1295 1290	n=6. mean=1293. std dev=13.3.

STD (ng/mL)	Peak area readings x 10 ³ at 228.8 nm	Statistical analysis
40.0	1505 1567 1535 1567 1566 1572	n=6. mean=1552. std dev=26.6. CV=0.017.

Table 5—Analytical Method Recovery [Flame AAS Analysis]

Test level	0.5x			1.0x			2.0x		
	µg taken	µg found	Percent rec.	µg taken	µg found	Percent rec.	µg taken	µg found	Percent rec.
1.00	1.0715	107.2	107.2	2.00	2.0688	103.4	4.00	4.1504	103.8
1.00	1.0842	108.4	108.4	2.00	2.0174	100.9	4.00	4.1108	102.8
1.00	1.0842	108.4	108.4	2.00	2.0431	102.2	4.00	4.0581	101.5
1.00	*1.0081	*100.8	2.00	2.0431	102.2	4.00	4.0844	102.1	
1.00	1.0715	107.2	2.00	2.0174	100.9	4.00	4.1504	103.8	
1.00	1.0842	108.4	2.00	2.0045	100.2	4.00	4.1899	104.7	
n=				5		6		6	
mean=				107.9		101.6		103.1	
std dev=				0.657		1.174		1.199	
CV ₁ =				0.006		0.011		0.012	
CV ₁ (pooled)=				0.010					

*Rejected as an outlier—this value did not pass the outlier T-test at the 99% confidence level.

Test level 0.1x

taken	µg found	µg rec.	Percent
0.200	0.2509	125.5	
0.200	0.2509	125.5	
0.200	0.2761	138.1	
0.200	0.2258	112.9	
0.200	0.2258	112.9	
0.200	0.1881	94.1	
n=		6	
mean=		118.2	
std dev=		15.1	
CV ₁ =		0.128	

Table 6—Analytical Method Recovery [AAS-HGA analysis]

Test level	0.5x			1.0x			2.0x		
	ng taken	ng found	Percent rec.	ng taken	ng found	Percent rec.	ng taken	ng found	Percent rec.
75	71.23	95.0	150	138.00	92.0	300	258.43	86.1	
75	71.47	95.3	150	138.29	92.2	300	258.46	86.2	
75	70.02	93.4	150	136.30	90.9	300	280.55	93.5	
75	77.34	103.1	150	146.62	97.7	300	288.34	96.1	
75	78.32	104.4	150	145.17	96.8	300	261.74	87.2	
75	71.96	95.9	150	144.88	96.6	300	277.22	92.4	
n=		6		6		6			
mean=		97.9		94.4		90.3			
std dev=		4.66		2.98		4.30			
CV ₁ =		0.048		0.032		0.048			
CV ₁ (pooled)=		0.043							

- (6) Instrumental Parameters for Flame AAS Analysis
Atomic Absorption Spectrophotometer
(Perkin-Elmer Model 603)
Flame: Air/Acetylene—lean, blue
Oxidant Flow: 55
Fuel Flow: 32
Wavelength: 228.8 nm
Slit: 4 (0.7 nm)
Range: UV
Signal: Concentration (4 exp)
Integration Time: 3 sec
- (7) Instrumental Parameters for HGA Analysis
Atomic Absorption Spectrophotometer
(Perkin-Elmer Model 5100)
Signal Type: Zeeman AA
Slitwidth: 0.7 nm
Wavelength: 228.8 nm
Measurement: Peak Area
Integration Time: 6.0 sec
BOC Time: 5 sec BOC=Background Offset
Correction. Zeeman Graphite Furnace
(Perkin-Elmer Model HGA-600)

Step	Ramp time (sec)	Hold time (sec)	Temp. (°C)	Argon flow (mL/min)	Read (sec)
1) Predry	5	10	90	300	
2) Dry	30	10	140	300	
3) Char	10	20	900	300	
4) Cool Down	1	8	30	300	
5) Atomize	0	5	1600	0	-1
6) Burnout	1	8	2500	300	

[Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-62-07449, filed 10/20/93, effective 12/1/93; 93-07-044 (Order 93-01), § 296-62-07449, filed 3/13/93, effective 4/27/93.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-62-07451 A short description of Appendix F to 29 CFR 1910.1027—Nonmandatory protocol for biological monitoring. Appendix F is not included in this standard due to limited employer/employee application. The following is a brief synopsis of the content of Appendix F to 29 CFR 1910.1027, Cadmium.

(1) The medical monitoring program for cadmium requires that blood and urine samples must be collected at defined intervals from workers by physicians responsible for medical monitoring. These samples are sent to commercial laboratories that perform the required analyses and report results of these analyses to the responsible physicians. To ensure the accuracy and reliability of these laboratory analyses, the laboratories to which samples are submitted should participate in an ongoing and efficacious proficiency testing program.

(2) This nonmandatory protocol is intended to provide guidelines and recommendations for physicians and laboratories to improve the accuracy and reliability of the procedures used to analyze the biological samples collected as part of the medical monitoring program for cadmium. This protocol provides procedures for characterizing and maintaining the qual-

ity of analytic results derived from the analyses of cadmium in blood (CDB), cadmium in urine (CDU), and beta-2-microglobulin in urine (B2MU) by commercial laboratories. Laboratories conforming to the provisions of this nonmandatory protocol shall be known as "participating laboratories."

(3) This protocol describes procedures that may be used by the responsible physicians to identify laboratories most likely to be proficient in the analysis of samples used in the biological monitoring of cadmium. It also provides procedures for record keeping and reporting by laboratories participating in proficiency testing programs, and recommendations to assist these physicians in interpreting analytical results determined by participating laboratories.

(4) For those needing Appendix F, 29 CFR 1910.1027, in its entirety, a copy may be obtained by request to:

Department of Labor and Industries
Division of Industrial Safety and Health
Standards and Information
Post Office Box 44620
Olympia, Washington 98504-4620
or telephone (360) 956-5527

[Statutory Authority: Chapter 49.17 RCW. 93-07-044 (Order 93-01), § 296-62-07451, filed 3/13/93, effective 4/27/93.]

WAC 296-62-07460 Butadiene. (1) Scope and application.

(a) This section applies to all occupational exposures to 1,3-Butadiene (BD), Chemical Abstracts Service Registry No. 106-99-0, except as provided in (b) of this subsection.

(b)(i) Except for the recordkeeping provisions in subsection (13)(a) of this section, this section does not apply to the processing, use, or handling of products containing BD or to other work operations and streams in which BD is present where objective data are reasonably relied upon that demonstrate the work operation or the product or the group of products or operations to which it belongs may not reasonably be foreseen to release BD in airborne concentrations at or above the action level or in excess of the STEL under the expected conditions of processing, use, or handling that will cause the greatest possible release or in any plausible accident.

(ii) This section also does not apply to work operations, products or streams where the only exposure to BD is from liquid mixtures containing 0.1% or less of BD by volume or the vapors released from such liquids, unless objective data become available that show that airborne concentrations generated by such mixtures can exceed the action level or STEL under reasonably predictable conditions of processing, use or handling that will cause the greatest possible release.

(iii) Except for labeling requirements and requirements for emergency response, this section does not apply to the storage, transportation, distribution or sale of BD or liquid mixtures in intact containers or in transportation pipelines sealed in such a manner as to fully contain BD vapors or liquids.

(c) Where products or processes containing BD are exempted under (b) of this subsection, the employer shall maintain records of the objective data supporting that exemption and the basis for the employer's reliance on the data, as provided in subsection (13)(a) of this section.

(2) Definitions: For the purpose of this section, the following definitions shall apply:

"Action level" means a concentration of airborne BD of 0.5 ppm calculated as an 8-hour time-weighted average.

"Director" means the director of the department of labor and industries, or authorized representatives.

"Authorized person" means any person specifically designated by the employer, whose duties require entrance into a regulated area, or a person entering such an area as a designated representative of employees to exercise the right to observe monitoring and measuring procedures under subsection (4)(h) of this section, or a person designated under the WISH Act or regulations issued under the WISH Act to enter a regulated area.

"1,3-Butadiene" means an organic compound with chemical formula $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$ that has a molecular weight of approximately 54.15 gm/mole.

"Business day" means any Monday through Friday, except those days designated as federal, state, local or company specific holidays.

"Complete blood count (CBC)" means laboratory tests performed on whole blood specimens and includes the following: White blood cell count (WBC), hematocrit (Hct), red blood cell count (RBC), hemoglobin (Hgb), differential count of white blood cells, red blood cell morphology, red blood cell indices, and platelet count.

"Day" means any part of a calendar day.

"Emergency situation" means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of BD.

"Employee exposure" means exposure of a worker to airborne concentrations of BD which would occur if the employee were not using respiratory protective equipment.

"Objective data" means monitoring data, or mathematical modelling or calculations based on composition, chemical and physical properties of a material, stream or product.

"Permissible exposure limits (PELs)" means either the 8-hour time-weighted average (8-hr TWA) exposure or the short-term exposure limit (STEL).

"Physician or other licensed health care professional" is an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide one or more of the specific health care services required by (k) of this subsection.

"Regulated area" means any area where airborne concentrations of BD exceed or can reasonably be expected to exceed the 8-hour time-weighted average (8-hr TWA) exposure of 1 ppm or the short-term exposure limit (STEL) of 5 ppm for 15 minutes.

"This section" means this 1,3-butadiene standard.

(3) Permissible exposure limits (PELs).

(a) Time-weighted average (TWA) limit. The employer shall ensure that no employee is exposed to an airborne concentration of BD in excess of one part BD per million parts of air (ppm) measured as an eight (8)-hour time-weighted average.

(b) Short-term exposure limit (STEL). The employer shall ensure that no employee is exposed to an airborne con-

centration of BD in excess of five parts of BD per million parts of air (5 ppm) as determined over a sampling period of fifteen minutes.

(4) Exposure monitoring.

(a) General.

(i) Determinations of employee exposure shall be made from breathing zone air samples that are representative of the 8-hour TWA and 15-minute short-term exposures of each employee.

(ii) Representative 8-hour TWA employee exposure shall be determined on the basis of one or more samples representing full-shift exposure for each shift and for each job classification in each work area.

(iii) Representative 15-minute short-term employee exposures shall be determined on the basis of one or more samples representing 15-minute exposures associated with operations that are most likely to produce exposures above the STEL for each shift and for each job classification in each work area.

(iv) Except for the initial monitoring required under (b) of this subsection, where the employer can document that exposure levels are equivalent for similar operations on different work shifts, the employer need only determine representative employee exposure for that operation from the shift during which the highest exposure is expected.

(b) Initial monitoring.

(i) Each employer who has a workplace or work operation covered by this section, shall perform initial monitoring to determine accurately the airborne concentrations of BD to which employees may be exposed, or shall rely on objective data pursuant to subsection (1)(b)(i) of this section to fulfill this requirement.

(ii) Where the employer has monitored within two years prior to the effective date of this section and the monitoring satisfies all other requirements of this section, the employer may rely on such earlier monitoring results to satisfy the requirements of (b)(i) of this subsection, provided that the conditions under which the initial monitoring was conducted have not changed in a manner that may result in new or additional exposures.

(c) Periodic monitoring and its frequency.

(i) If the initial monitoring required by (b) of this subsection reveals employee exposure to be at or above the action level but at or below both the 8-hour TWA limit and the STEL, the employer shall repeat the representative monitoring required by (a) of this subsection every twelve months.

(ii) If the initial monitoring required by (b) of this subsection reveals employee exposure to be above the 8-hour TWA limit, the employer shall repeat the representative monitoring required by (a)(ii) of this subsection at least every three months until the employer has collected two samples per quarter (each at least 7 days apart) within a two-year period, after which such monitoring must occur at least every six months.

(iii) If the initial monitoring required by (b) of this subsection reveals employee exposure to be above the STEL, the employer shall repeat the representative monitoring required by (a)(iii) of this subsection at least every three months until the employer has collected two samples per quarter (each at

least 7 days apart) within a two-year period, after which such monitoring must occur at least every six months.

(iv) The employer may alter the monitoring schedule from every six months to annually for any required representative monitoring for which two consecutive measurements taken at least 7 days apart indicate that employee exposure has decreased to or below the 8-hour TWA, but is at or above the action level.

(d) Termination of monitoring.

(i) If the initial monitoring required by (b) of this subsection reveals employee exposure to be below the action level and at or below the STEL, the employer may discontinue the monitoring for employees whose exposures are represented by the initial monitoring.

(ii) If the periodic monitoring required by (c) of this subsection reveals that employee exposures, as indicated by at least two consecutive measurements taken at least 7 days apart, are below the action level and at or below the STEL, the employer may discontinue the monitoring for those employees who are represented by such monitoring.

(e) Additional monitoring.

(i) The employer shall institute the exposure monitoring required under subsection (4) of this section whenever there has been a change in the production, process, control equipment, personnel or work practices that may result in new or additional exposures to BD or when the employer has any reason to suspect that a change may result in new or additional exposures.

(ii) Whenever spills, leaks, ruptures or other breakdowns occur that may lead to employee exposure above the 8-hr TWA limit or above the STEL, the employer shall monitor (using leak source, such as direct reading instruments, area or personal monitoring), after the cleanup of the spill or repair of the leak, rupture or other breakdown, to ensure that exposures have returned to the level that existed prior to the incident.

(f) Accuracy of monitoring.

Monitoring shall be accurate, at a confidence level of 95 percent, to within plus or minus 25 percent for airborne concentrations of BD at or above the 1 ppm TWA limit and to within plus or minus 35 percent for airborne concentrations of BD at or above the action level of 0.5 ppm and below the 1 ppm TWA limit.

(g) Employee notification of monitoring results.

(i) The employer shall, within 5 business days after the receipt of the results of any monitoring performed under this section, notify the affected employees of these results in writing either individually or by posting of results in an appropriate location that is accessible to affected employees.

(ii) The employer shall, within 15 business days after receipt of any monitoring performed under this section indicating the 8-hour TWA or STEL has been exceeded, provide the affected employees, in writing, with information on the corrective action being taken by the employer to reduce employee exposure to or below the 8-hour TWA or STEL and the schedule for completion of this action.

(h) Observation of monitoring.

(i) Employee observation. The employer shall provide affected employees or their designated representatives an

opportunity to observe any monitoring of employee exposure to BD conducted in accordance with this section.

(ii) Observation procedures. When observation of the monitoring of employee exposure to BD requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the observer at no cost with protective clothing and equipment, and shall ensure that the observer uses this equipment and complies with all other applicable safety and health procedures.

(5) Regulated areas.

(a) The employer shall establish a regulated area whenever occupational exposures to airborne concentrations of BD exceed or can reasonably be expected to exceed the permissible exposure limits, either the 8-hr TWA or the STEL.

(b) Access to regulated areas shall be limited to authorized persons.

(c) Regulated areas shall be demarcated from the rest of the workplace in any manner that minimizes the number of employees exposed to BD within the regulated area.

(d) An employer at a multiemployer worksite who establishes a regulated area shall communicate the access restrictions and locations of these areas to other employers with work operations at that worksite whose employees may have access to these areas.

(6) Methods of compliance.

(a) Engineering controls and work practices.

(i) The employer shall institute engineering controls and work practices to reduce and maintain employee exposure to or below the PELs, except to the extent that the employer can establish that these controls are not feasible or where subsection (8)(a)(i) of this section applies.

(ii) Wherever the feasible engineering controls and work practices which can be instituted are not sufficient to reduce employee exposure to or below the 8-hour TWA or STEL, the employer shall use them to reduce employee exposure to the lowest levels achievable by these controls and shall supplement them by the use of respiratory protection that complies with the requirements of subsection (8) of this section.

(b) Compliance plan.

(i) Where any exposures are over the PELs, the employer shall establish and implement a written plan to reduce employee exposure to or below the PELs primarily by means of engineering and work practice controls, as required by (a) of this subsection, and by the use of respiratory protection where required or permitted under this section. No compliance plan is required if all exposures are under the PELs.

(ii) The written compliance plan shall include a schedule for the development and implementation of the engineering controls and work practice controls including periodic leak detection surveys.

(iii) Copies of the compliance plan required in (b) of this subsection shall be furnished upon request for examination and copying to the director, affected employees and designated employee representatives. Such plans shall be reviewed at least every 12 months, and shall be updated as necessary to reflect significant changes in the status of the employer's compliance program.

(iv) The employer shall not implement a schedule of employee rotation as a means of compliance with the PELs.

(7) Exposure goal program.

(a) For those operations and job classifications where employee exposures are greater than the action level, in addition to compliance with the PELs, the employer shall have an exposure goal program that is intended to limit employee exposures to below the action level during normal operations.

(b) Written plans for the exposure goal program shall be furnished upon request for examination and copying to the director, affected employees and designated employee representatives.

(c) Such plans shall be updated as necessary to reflect significant changes in the status of the exposure goal program.

(d) Respirator use is not required in the exposure goal program.

(e) The exposure goal program shall include the following items unless the employer can demonstrate that the item is not feasible, will have no significant effect in reducing employee exposures, or is not necessary to achieve exposures below the action level:

(i) A leak prevention, detection, and repair program.

(ii) A program for maintaining the effectiveness of local exhaust ventilation systems.

(iii) The use of pump exposure control technology such as, but not limited to, mechanical double-sealed or seal-less pumps.

(iv) Gauging devices designed to limit employee exposure, such as magnetic gauges on rail cars.

(v) Unloading devices designed to limit employee exposure, such as a vapor return system.

(vi) A program to maintain BD concentration below the action level in control rooms by use of engineering controls.

(8) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls;

(ii) Nonroutine work operations that are performed infrequently and for which exposures are limited in duration;

(iii) Work operations for which feasible engineering controls and work-practice controls are not yet sufficient to reduce employee exposures to or below the PELs;

(iv) Emergencies.

(b) Respirator program.

(i) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1), 296-62-07131 (4)(b)(i) and (ii), and 296-62-07150 through 296-62-07156).

(ii) If air-purifying respirators are used, the employer must replace the air-purifying filter elements according to the replacement schedule set for the class of respirators listed in Table 1 of this section, and at the beginning of each work shift.

(iii) Instead of using the replacement schedule listed in Table 1 of this section, the employer may replace cartridges or canisters at 90% of their expiration service life, provided the employer:

(A) Demonstrates that employees will be adequately protected by this procedure;

(B) Uses BD breakthrough data for this purpose that have been derived from tests conducted under worst-case conditions of humidity, temperature, and air-flow rate through the filter element, and the employer also describes the data supporting the cartridge- or canister-change schedule, as well as the basis for using the data in the employer's respirator program.

(iv) A label must be attached to each filter element to indicate the date and time it is first installed on the respirator.

(v) If NIOSH approves an end-of-service-life indicator (ESLI) for an air-purifying filter element, the element may be used until the ESLI shows no further useful service life or until the element is replaced at the beginning of the next work shift, whichever occurs first.

(vi) Regardless of the air-purifying element used, if an employee detects the odor of BD, the employer must replace the air-purifying element immediately.

(c) Respirator selection.

(i) The employer must select appropriate respirators from Table 1 of this section.

Table 1. - Minimum Requirements for Respiratory Protection for Airborne BD

Concentration of Airborne BD (ppm) or condition of use	Minimum required respirator
Less than or equal to 5 ppm(5 times PEL)	(a) Air-purifying half mask or full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 4 hours.
Less than or equal to 10 ppm(10 times PEL)	(a) Air-purifying half mask or full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 3 hours.
Less than or equal to 25 ppm(25 times PEL)	(a) Air-purifying full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 2 hours. (b) Any powered air-purifying respirator equipped with approved BD or organic vapor cartridges. PAPR cartridges shall be replaced every 2 hours.

Concentration of Airborne BD (ppm) or condition of use	Minimum required respirator
Less than or equal to 50 ppm(50 times PEL)	(c) Continuous flow supplied air respirator equipped with a hood or helmet. (a) Air-purifying full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 1 hour. (b) Powered air purifying respirator equipped with a tight-fitting facepiece and an approved BD or organic vapor cartridges. PAPR cartridges shall be replaced every 1 hour.
Less than or equal to 1,000 ppm (1,000 times PEL)	(a) Supplied air respirator equipped with a half mask or full facepiece and operated in a pressure demand or other positive pressure mode.
Greater than 1,000 ppm	(a) Self-contained breathing unknown concentration, or apparatus equipped with a fire fighting full facepiece and operated in a pressure demand or other positive pressure mode. (b) Any supplied air respirator equipped with a full facepiece and operated in a pressure demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure demand or other positive pressure mode.
Escape from IDLH Conditions	(a) Any positive pressure self-contained breathing apparatus with an appropriate service life. (b) Any air-purifying full facepiece respirator equipped with a front or back mounted BD or organic vapor canister.

Notes: Respirators approved for use in higher concentrations are permitted to be used in lower concentrations. Full facepiece is required when eye irritation is anticipated.

(ii) Air-purifying respirators must have filter elements certified by NIOSH for organic vapor or BD.

(iii) When an employee whose job requires the use of a respirator cannot use a negative-pressure respirator, the employer must provide the employee with a respirator that has less breathing resistance than the negative-pressure respirator, such as a powered air-purifying respirator or supplied-air respirator, when the employee is able to use it and if it provides the employee adequate protection.

(9) Protective clothing and equipment. Where appropriate to prevent eye contact and limit dermal exposure to BD, the employer shall provide protective clothing and equipment at no cost to the employee and shall ensure its use. Eye and face protection shall meet the requirements of WAC 296-24-078.

(10) Emergency situations. Written plan. A written plan for emergency situations shall be developed, or an existing plan shall be modified, to contain the applicable elements specified in WAC 296-24-567, Employee emergency plans and fire prevention plans, and in WAC 296-62-3112, hazardous waste operations and emergency responses, for each workplace where there is a possibility of an emergency.

(11) Medical screening and surveillance.

(a) Employees covered. The employer shall institute a medical screening and surveillance program as specified in this subsection for:

(i) Each employee with exposure to BD at concentrations at or above the action level on 30 or more days or for employ-

ees who have or may have exposure to BD at or above the PELs on 10 or more days a year;

(ii) Employers (including successor owners) shall continue to provide medical screening and surveillance for employees, even after transfer to a non-BD exposed job and regardless of when the employee is transferred, whose work histories suggest exposure to BD:

(A) At or above the PELs on 30 or more days a year for 10 or more years;

(B) At or above the action level on 60 or more days a year for 10 or more years; or

(C) Above 10 ppm on 30 or more days in any past year; and

(iii) Each employee exposed to BD following an emergency situation.

(b) Program administration.

(i) The employer shall ensure that the health questionnaire, physical examination and medical procedures are provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(ii) Physical examinations, health questionnaires, and medical procedures shall be performed or administered by a physician or other licensed health care professional.

(iii) Laboratory tests shall be conducted by an accredited laboratory.

(c) Frequency of medical screening activities. The employer shall make medical screening available on the following schedule:

(i) For each employee covered under (a)(i) and (ii) of this subsection, a health questionnaire and complete blood count

(CBC) with differential and platelet count every year, and a physical examination as specified below:

(A) An initial physical examination that meets the requirements of this rule, if twelve months or more have elapsed since the last physical examination conducted as part of a medical screening program for BD exposure;

(B) Before assumption of duties by the employee in a job with BD exposure;

(C) Every 3 years after the initial physical examination;

(D) At the discretion of the physician or other licensed health care professional reviewing the annual health questionnaire and CBC;

(E) At the time of employee reassignment to an area where exposure to BD is below the action level, if the employee's past exposure history does not meet the criteria of (a)(ii) of this subsection for continued coverage in the screening and surveillance program, and if twelve months or more have elapsed since the last physical examination; and

(F) At termination of employment if twelve months or more have elapsed since the last physical examination.

(ii) Following an emergency situation, medical screening shall be conducted as quickly as possible, but not later than 48 hours after the exposure.

(iii) For each employee who must wear a respirator, physical ability to perform the work and use the respirator must be determined as required by WAC 296-62-071.

(d) Content of medical screening.

(i) Medical screening for employees covered by (a)(i) and (ii) of this subsection shall include:

(A) A baseline health questionnaire that includes a comprehensive occupational and health history and is updated annually. Particular emphasis shall be placed on the hematopoietic and reticuloendothelial systems, including exposure to chemicals, in addition to BD, that may have an adverse effect on these systems, the presence of signs and symptoms that might be related to disorders of these systems, and any other information determined by the examining physician or other licensed health care professional to be necessary to evaluate whether the employee is at increased risk of material impairment of health from BD exposure. Health questionnaires shall consist of the sample forms in Appendix C to this section, or be equivalent to those samples;

(B) A complete physical examination, with special emphasis on the liver, spleen, lymph nodes, and skin;

(C) A CBC; and

(D) Any other test which the examining physician or other licensed health care professional deems necessary to evaluate whether the employee may be at increased risk from exposure to BD.

(ii) Medical screening for employees exposed to BD in an emergency situation shall focus on the acute effects of BD exposure and at a minimum include: A CBC within 48 hours of the exposure and then monthly for three months; and a physical examination if the employee reports irritation of the eyes, nose, throat, lungs, or skin, blurred vision, coughing, drowsiness, nausea, or headache. Continued employee participation in the medical screening and surveillance program, beyond these minimum requirements, shall be at the discretion of the physician or other licensed health care professional.

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(e) Additional medical evaluations and referrals.

(i) Where the results of medical screening indicate abnormalities of the hematopoietic or reticuloendothelial systems, for which a nonoccupational cause is not readily apparent, the examining physician or other licensed health care professional shall refer the employee to an appropriate specialist for further evaluation and shall make available to the specialist the results of the medical screening.

(ii) The specialist to whom the employee is referred under this subsection shall determine the appropriate content for the medical evaluation, e.g., examinations, diagnostic tests and procedures, etc.

(f) Information provided to the physician or other licensed health care professional. The employer shall provide the following information to the examining physician or other licensed health care professional involved in the evaluation:

(i) A copy of this section including its appendices;

(ii) A description of the affected employee's duties as they relate to the employee's BD exposure;

(iii) The employee's actual or representative BD exposure level during employment tenure, including exposure incurred in an emergency situation;

(iv) A description of pertinent personal protective equipment used or to be used; and

(v) Information, when available, from previous employment-related medical evaluations of the affected employee which is not otherwise available to the physician or other licensed health care professional or the specialist.

(g) The written medical opinion.

(i) For each medical evaluation required by this section, the employer shall ensure that the physician or other licensed health care professional produces a written opinion and provides a copy to the employer and the employee within 15 business days of the evaluation. The written opinion shall be limited to the following information:

(A) The occupationally pertinent results of the medical evaluation;

(B) A medical opinion concerning whether the employee has any detected medical conditions which would place the employee's health at increased risk of material impairment from exposure to BD;

(C) Any recommended limitations upon the employee's exposure to BD; and

(D) A statement that the employee has been informed of the results of the medical evaluation and any medical conditions resulting from BD exposure that require further explanation or treatment.

(ii) The written medical opinion provided to the employer shall not reveal specific records, findings, and diagnoses that have no bearing on the employee's ability to work with BD.

Note: This provision does not negate the ethical obligation of the physician or other licensed health care professional to transmit any other adverse findings directly to the employee.

(h) Medical surveillance.

(i) The employer shall ensure that information obtained from the medical screening program activities is aggregated (with all personal identifiers removed) and periodically reviewed, to ascertain whether the health of the employee

population of that employer is adversely affected by exposure to BD.

(ii) Information learned from medical surveillance activities must be disseminated to covered employees, as defined in (a) of this subsection, in a manner that ensures the confidentiality of individual medical information.

(12) Communication of BD hazards to employees.

(a) Hazard communication. The employer shall communicate the hazards associated with BD exposure in accordance with the requirements of the hazard communication standard, WAC 296-62-054.

(b) Employee information and training.

(i) The employer shall provide all employees exposed to BD with information and training in accordance with the requirements of the hazard communication standard, WAC 296-62-054.

(ii) The employer shall institute a training program for all employees who are potentially exposed to BD at or above the action level or the STEL, ensure employee participation in the program and maintain a record of the contents of such program.

(iii) Training shall be provided prior to or at the time of initial assignment to a job potentially involving exposure to BD at or above the action level or STEL and at least annually thereafter.

(iv) The training program shall be conducted in a manner that the employee is able to understand. The employer shall ensure that each employee exposed to BD over the action level or STEL is informed of the following:

(A) The health hazards associated with BD exposure, and the purpose and a description of the medical screening and surveillance program required by this section;

(B) The quantity, location, manner of use, release, and storage of BD and the specific operations that could result in exposure to BD, especially exposures above the PEL or STEL;

(C) The engineering controls and work practices associated with the employee's job assignment, and emergency procedures and personal protective equipment;

(D) The measures employees can take to protect themselves from exposure to BD;

(E) The contents of this standard and its appendices; and

(F) The right of each employee exposed to BD at or above the action level or STEL to obtain:

(I) Medical examinations as required by subsection (10) of this section at no cost to the employee;

(II) The employee's medical records required to be maintained by subsection (13)(c) of this section; and

(III) All air monitoring results representing the employee's exposure to BD and required to be kept by subsection (13)(b) of this section.

(c) Access to information and training materials.

(i) The employer shall make a copy of this standard and its appendices readily available without cost to all affected employees and their designated representatives and shall provide a copy if requested.

(ii) The employer shall provide to the director, or the designated employee representatives, upon request, all materials relating to the employee information and the training program.

(13) Recordkeeping.

(a) Objective data for exemption from initial monitoring.

(i) Where the processing, use, or handling of products or streams made from or containing BD are exempted from other requirements of this section under subsection (1)(b) of this section, or where objective data have been relied on in lieu of initial monitoring under subsection (4)(b)(ii) of this section, the employer shall establish and maintain a record of the objective data reasonably relied upon in support of the exemption.

(ii) This record shall include at least the following information:

(A) The product or activity qualifying for exemption;

(B) The source of the objective data;

(C) The testing protocol, results of testing, and analysis of the material for the release of BD;

(D) A description of the operation exempted and how the data support the exemption; and

(E) Other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.

(iii) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

(b) Exposure measurements.

(i) The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to BD as prescribed in subsection (4) of this section.

(ii) The record shall include at least the following information:

(A) The date of measurement;

(B) The operation involving exposure to BD which is being monitored;

(C) Sampling and analytical methods used and evidence of their accuracy;

(D) Number, duration, and results of samples taken;

(E) Type of protective devices worn, if any;

(F) Name, Social Security number and exposure of the employees whose exposures are represented; and

(G) The written corrective action and the schedule for completion of this action required by subsection (4)(g)(ii) of this section.

(iii) The employer shall maintain this record for at least 30 years in accordance with WAC 296-62-052.

(c) Medical screening and surveillance.

(i) The employer shall establish and maintain an accurate record for each employee subject to medical screening and surveillance under this section.

(ii) The record shall include at least the following information:

(A) The name and Social Security number of the employee;

(B) Physician's or other licensed health care professional's written opinions as described in subsection (1)(e) of this section;

(C) A copy of the information provided to the physician or other licensed health care professional as required by subsection (11)(e) of this section.

(iii) Medical screening and surveillance records shall be maintained for each employee for the duration of employment plus 30 years, in accordance with WAC 296-62-052.

(d) Availability.

(i) The employer, upon written request, shall make all records required to be maintained by this section available for examination and copying to the director.

(ii) Access to records required to be maintained by (a) and (b) of this subsection shall be granted in accordance with WAC 296-62-05209.

(e) Transfer of records.

(i) Whenever the employer ceases to do business, the employer shall transfer records required by this section to the successor employer. The successor employer shall receive and maintain these records. If there is no successor employer, the employer shall notify the director, at least three months prior to disposal, and transmit them to the director if requested by the director within that period.

(ii) The employer shall transfer medical and exposure records as set forth in WAC 296-62-05215.

(14) Dates.

(a) Effective date. This section shall become effective (day, month), 1997.

(b) Start-up dates.

(i) The initial monitoring required under subsection (4)(b) of this section shall be completed immediately or within sixty days of the introduction of BD into the workplace.

(ii) The requirements of subsections (3) through (13) of this section, including feasible work practice controls but not including engineering controls specified in subsection (6)(a) of this section, shall be complied with immediately.

(iii) Engineering controls specified by subsection (6)(a) of this section shall be implemented by February 4, 1999, and the exposure goal program specified in subsection (7) of this section shall be implemented by February 4, 2000.

(15) Appendices.

Appendices A, B, C, D, and F to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

Appendix A. Substance Safety Data Sheet For 1,3-Butadiene (Non-Mandatory)

(1) Substance Identification.

(a) Substance: 1,3-Butadiene (CH₂=CH-CH=CH₂).

(b) Synonyms: 1,3-Butadiene (BD); butadiene; biethylene; bi-vinyl; divinyl; butadiene-1,3; buta-1,3-diene; erythrene; NCI-C50602; CAS-106-99-0.

(c) BD can be found as a gas or liquid.

(d) BD is used in production of styrene-butadiene rubber and polybutadiene rubber for the tire industry. Other uses include copolymer latexes for carpet backing and paper coating, as well as resins and polymers for pipes and automobile and appliance parts. It is also used as an intermediate in the production of such chemicals as fungicides.

(e) Appearance and odor: BD is a colorless, non-corrosive, flammable gas with a mild aromatic odor at standard ambient temperature and pressure.

(f) Permissible exposure: Exposure may not exceed 1 part BD per million parts of air averaged over the 8-hour workday, nor may short-term exposure exceed 5 parts of BD per million parts of air averaged over any 15-minute period in the 8-hour workday.

(2) Health Hazard Data.

(a) BD can affect the body if the gas is inhaled or if the liquid form, which is very cold (cryogenic), comes in contact with the eyes or skin.

(b) Effects of overexposure: Breathing very high levels of BD for a short time can cause central nervous system effects, blurred vision, nausea, fatigue, headache, decreased blood pressure and pulse rate, and unconsciousness. There are no recorded cases of accidental exposures at high levels that have caused death in humans, but this could occur. Breathing lower levels of BD may cause irritation of the eyes, nose, and throat. Skin contact with liquefied BD can cause irritation and frostbite.

(c) Long-term (chronic) exposure: BD has been found to be a potent carcinogen in rodents, inducing neoplastic lesions at multiple target sites in mice and rats. A recent study of BD-exposed workers showed that exposed workers have an increased risk of developing leukemia. The risk of leukemia increases with increased exposure to BD. OSHA has concluded that there is strong evidence that workplace exposure to BD poses an increased risk of death from cancers of the lymphohematopoietic system.

(d) Reporting signs and symptoms: You should inform your supervisor if you develop any of these signs or symptoms and suspect that they are caused by exposure to BD.

(3) Emergency First Aid Procedures.

In the event of an emergency, follow the emergency plan and procedures designated for your work area. If you have been trained in first aid procedures, provide the necessary first aid measures. If necessary, call for additional assistance from co-workers and emergency medical personnel.

(a) Eye and Skin Exposures: If there is a potential that liquefied BD can come in contact with eye or skin, face shields and skin protective equipment must be provided and used. If liquefied BD comes in contact with the eye, immediately flush the eyes with large amounts of water, occasionally lifting the lower and the upper lids. Flush repeatedly. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. In the event of skin contact, which can cause frostbite, remove any contaminated clothing and flush the affected area repeatedly with large amounts of tepid water.

(b) Breathing: If a person breathes in large amounts of BD, move the exposed person to fresh air at once. If breathing has stopped, begin cardiopulmonary resuscitation (CPR) if you have been trained in this procedure. Keep the affected person warm and at rest. Get medical attention immediately.

(c) Rescue: Move the affected person from the hazardous exposure. If the exposed person has been overcome, call for help and begin emergency rescue procedures. Use extreme caution so that you do not become a casualty. Understand the plant's emergency rescue procedures and know the locations of rescue equipment before the need arises.

(4) Respirators and Protective Clothing.

(a) Respirators: Good industrial hygiene practices recommend that engineering and work practice controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not

technically feasible, when such controls are in the process of being installed, or when these controls fail and need to be supplemented or during brief, non-routine, intermittent exposure. Respirators may also be used in situations involving non-routine work operations which are performed infrequently and in which exposures are limited in duration, and in emergency situations. In some instances cartridge respirator use is allowed, but only with strict time constraints. For example, at exposure below 5 ppm BD, a cartridge (or canister) respirator, either full or half face, may be used, but the cartridge must be replaced at least every 4 hours, and it must be replaced every 3 hours when the exposure is between 5 and 10 ppm.

If the use of respirators is necessary, the only respirators permitted are those that have been approved by the National Institute for Occupational Safety and Health (NIOSH). In addition to respirator selection, a complete respiratory protection program must be instituted which includes regular training, maintenance, fit testing, inspection, cleaning, and evaluation of respirators. If you can smell BD while wearing a respirator, proceed immediately to fresh air, and change cartridge (or canister) before re-entering an area where there is BD exposure. If you experience difficulty in breathing while wearing a respirator, tell your supervisor.

(b) Protective Clothing: Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent the skin from becoming frozen by contact with liquefied BD (or a vessel containing liquid BD).

Employees should be provided with and required to use splash-proof safety goggles where liquefied BD may contact the eyes.

(5) Precautions for Safe Use, Handling, and Storage.

(a) Fire and Explosion Hazards: BD is a flammable gas and can easily form explosive mixtures in air. It has a lower explosive limit of 2%, and an upper explosive limit of 11.5%. It has an autoignition temperature of 420 deg. C (788 deg. F). Its vapor is heavier than air (vapor density, 1.9) and may travel a considerable distance to a source of ignition and flash back. Usually it contains inhibitors to prevent self-polymerization (which is accompanied by evolution of heat) and to prevent formation of explosive peroxides. At elevated temperatures, such as in fire conditions, polymerization may take place. If the polymerization takes place in a container, there is a possibility of violent rupture of the container.

(b) Hazard: Slightly toxic. Slight respiratory irritant. Direct contact of liquefied BD on skin may cause freeze burns and frostbite.

(c) Storage: Protect against physical damage to BD containers. Outside or detached storage of BD containers is preferred. Inside storage should be in a cool, dry, well-ventilated, noncombustible location, away from all possible sources of ignition. Store cylinders vertically and do not stack. Do not store with oxidizing material.

(d) Usual Shipping Containers: Liquefied BD is contained in steel pressure apparatus.

(e) Electrical Equipment: Electrical installations in Class I hazardous locations, as defined in Article 500 of the National Electrical Code, should be in accordance with Arti-

cle 501 of the Code. If explosion-proof electrical equipment is necessary, it shall be suitable for use in Group B. Group D equipment may be used if such equipment is isolated in accordance with Section 501-5(a) by sealing all conduit 1/2-inch size or larger. See Venting of Deflagrations (NFPA No. 68, 1994), National Electrical Code (NFPA No. 70, 1996), Static Electricity (NFPA No. 77, 1993), Lightning Protection Systems (NFPA No. 780, 1995), and Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids (NFPA No. 325, 1994).

(f) Fire Fighting: Stop flow of gas. Use water to keep fire-exposed containers cool. Fire extinguishers and quick drenching facilities must be readily available, and you should know where they are and how to operate them.

(g) Spill and Leak: Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until clean-up has been completed. If BD is spilled or leaked, the following steps should be taken:

(i) Eliminate all ignition sources.

(ii) Ventilate area of spill or leak.

(iii) If in liquid form, for small quantities, allow to evaporate in a safe manner.

(iv) Stop or control the leak if this can be done without risk. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place and repair the leak or allow the cylinder to empty.

(h) Disposal: This substance, when discarded or disposed of, is a hazardous waste according to Federal regulations (40 CFR part 261). It is listed as hazardous waste number D001 due to its ignitability. The transportation, storage, treatment, and disposal of this waste material must be conducted in compliance with 40 CFR parts 262, 263, 264, 268 and 270. Disposal can occur only in properly permitted facilities. Check state and local regulation of any additional requirements as these may be more restrictive than federal laws and regulation.

(i) You should not keep food, beverages, or smoking materials in areas where there is BD exposure, nor should you eat or drink in such areas.

(j) Ask your supervisor where BD is used in your work area and ask for any additional plant safety and health rules.

(6) Medical Requirements.

Your employer is required to offer you the opportunity to participate in a medical screening and surveillance program if you are exposed to BD at concentrations exceeding the action level (0.5 ppm BD as an 8-hour TWA) on 30 days or more a year, or at or above the 8-hr TWA (1 ppm) or STEL (5 ppm for 15 minutes) on 10 days or more a year. Exposure for any part of a day counts. If you have had exposure to BD in the past, but have been transferred to another job, you may still be eligible to participate in the medical screening and surveillance program.

The WISHA rule specifies the past exposures that would qualify you for participation in the program. These past exposure are work histories that suggest the following:

(a) That you have been exposed at or above the PELs on 30 days a year for 10 or more years;

(b) That you have been exposed at or above the action level on 60 days a year for 10 or more years; or

(c) That you have been exposed above 10 ppm on 30 days in any past year.

Additionally, if you are exposed to BD in an emergency situation, you are eligible for a medical examination within 48 hours. The basic medical screening program includes a health questionnaire, physical examination, and blood test. These medical evaluations must be offered to you at a reasonable time and place, and without cost or loss of pay.

(7) Observation of Monitoring.

Your employer is required to perform measurements that are representative of your exposure to BD and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear, the protective clothing and equipment.

(8) Access to Information.

(a) Each year, your employer is required to inform you of the information contained in this appendix. In addition, your employer must instruct you in the proper work practices for using BD, emergency procedures, and the correct use of protective equipment.

(b) Your employer is required to determine whether you are being exposed to BD. You or your representative has the right to observe employee measurements and to record the results obtained. Your employer is required to inform you of your exposure. If your employer determines that you are being overexposed, he or she is required to inform you of the actions which are being taken to reduce your exposure to within permissible exposure limits and of the schedule to implement these actions.

(c) Your employer is required to keep records of your exposures and medical examinations. These records must be kept by the employer for at least thirty (30) years.

(d) Your employer is required to release your exposure and medical records to you or your representative upon your request.

Appendix B. Substance Technical Guidelines for 1,3-Butadiene (Non-Mandatory)

(1) Physical and Chemical Data.

(a) Substance identification:

(i) Synonyms: 1,3-Butadiene (BD); butadiene; biethylene; bivinyl; divinyl; butadiene-1,3; buta-1,3-diene; erythrene; NCI-C50620; CAS-106-99-0.

(ii) Formula: $(CH_2)=CH-CH=CH_2$.

(iii) Molecular weight: 54.1.

(b) Physical data:

(i) Boiling point (760 mm Hg): -4.7 deg. C (23.5 deg. F).

(ii) Specific gravity (water=1): 0.62 at 20 deg. C (68 deg. F).

(iii) Vapor density (air=1 at boiling point of BD): 1.87.

(iv) Vapor pressure at 20 deg. C (68 deg. F): 910 mm Hg.

(v) Solubility in water, g/100 g water at 20 deg. C (68 deg. F): 0.05.

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(vi) Appearance and odor: Colorless, flammable gas with a mildly aromatic odor. Liquefied BD is a colorless liquid with a mildly aromatic odor.

(2) Fire, Explosion, and Reactivity Hazard Data.

(a) Fire:

(i) Flash point: -76 deg. C (-105 deg. F) for take out; liquefied BD; Not applicable to BD gas.

(ii) Stability: A stabilizer is added to the monomer to inhibit formation of polymer during storage. Forms explosive peroxides in air in absence of inhibitor.

(iii) Flammable limits in air, percent by volume: Lower: 2.0; Upper: 11.5.

(iv) Extinguishing media: Carbon dioxide for small fires, polymer or alcohol foams for large fires.

(v) Special fire fighting procedures: Fight fire from protected location or maximum possible distance. Stop flow of gas before extinguishing fire. Use water spray to keep fire-exposed cylinders cool.

(vi) Unusual fire and explosion hazards: BD vapors are heavier than air and may travel to a source of ignition and flash back. Closed containers may rupture violently when heated.

(vii) For purposes of compliance with the requirements of WAC 296-24-330, BD is classified as a flammable gas. For example, 7,500 ppm, approximately one-fourth of the lower flammable limit, would be considered to pose a potential fire and explosion hazard.

(viii) For purposes of compliance with WAC 296-24-585, BD is classified as a Class B fire hazard.

(ix) For purposes of compliance with WAC 296-24-956, locations classified as hazardous due to the presence of BD shall be Class I.

(b) Reactivity:

(i) Conditions contributing to instability: Heat. Peroxides are formed when inhibitor concentration is not maintained at proper level. At elevated temperatures, such as in fire conditions, polymerization may take place.

(ii) Incompatibilities: Contact with strong oxidizing agents may cause fires and explosions. The contacting of crude BD (not BD monomer) with copper and copper alloys may cause formations of explosive copper compounds.

(iii) Hazardous decomposition products: Toxic gases (such as carbon monoxide) may be released in a fire involving BD.

(iv) Special precautions: BD will attack some forms of plastics, rubber, and coatings. BD in storage should be checked for proper inhibitor content, for self-polymerization, and for formation of peroxides when in contact with air and iron. Piping carrying BD may become plugged by formation of rubbery polymer.

(c) Warning Properties:

(i) Odor Threshold: An odor threshold of 0.45 ppm has been reported in The American Industrial Hygiene Association (AIHA) Report, Odor Thresholds for Chemicals with Established Occupational Health Standards. (Ex. 32-28C).

(ii) Eye Irritation Level: Workers exposed to vapors of BD (concentration or purity unspecified) have complained of irritation of eyes, nasal passages, throat, and lungs. Dogs and rabbits exposed experimentally to as much as 6700 ppm for 7

1/2 hours a day for 8 months have developed no histologically demonstrable abnormality of the eyes.

(iii) Evaluation of Warning Properties: Since the mean odor threshold is about half of the 1 ppm PEL, and more than 10-fold below the 5 ppm STEL, most wearers of air purifying respirators should still be able to detect breakthrough before a significant overexposure to BD occurs.

(3) Spill, Leak, and Disposal Procedures.

(a) Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed. If BD is spilled or leaked, the following steps should be taken:

- (i) Eliminate all ignition sources.
- (ii) Ventilate areas of spill or leak.
- (iii) If in liquid form, for small quantities, allow to evaporate in a safe manner.
- (iv) Stop or control the leak if this can be done without risk. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place and repair the leak or allow the cylinder to empty.

(b) Disposal: This substance, when discarded or disposed of, is a hazardous waste according to Federal regulations (40 CFR part 261). It is listed by the EPA as hazardous

waste number D001 due to its ignitability. The transportation, storage, treatment, and disposal of this waste material must be conducted in compliance with 40 CFR parts 262, 263, 264, 268 and 270. Disposal can occur only in properly permitted facilities. Check state and local regulations for any additional requirements because these may be more restrictive than federal laws and regulations.

(4) Monitoring and Measurement Procedures.

(a) Exposure above the Permissible Exposure Limit (8-hr TWA) or Short-Term Exposure Limit (STEL):

(i) 8-hr TWA exposure evaluation: Measurements taken for the purpose of determining employee exposure under this standard are best taken with consecutive samples covering the full shift. Air samples must be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

(ii) STEL exposure evaluation: Measurements must represent 15 minute exposures associated with operations most likely to exceed the STEL in each job and on each shift.

(iii) Monitoring frequencies: Table 1 gives various exposure scenarios and their required monitoring frequencies, as required by the final standard for occupational exposure to butadiene.

Table 1. — Five Exposure Scenarios and Their Associated Monitoring Frequencies

Action Level	8-hr TWA	STEL	Required Monitoring Activity
—*	—	—	No 8-hr TWA or STEL monitoring required.
+*	—	—	No STEL monitoring required. Monitor 8-hr TWA annually.
+	—	—	No STEL monitoring required. Periodic monitoring 8-hr TWA, in accordance with (4)(c)(iii).**
+	+	+	Periodic monitoring 8-hr TWA, in accordance with (4)(c)(iii)**. Periodic monitoring STEL in accordance with (4)(c)(iii).
+	—	+	Periodic monitoring STEL, in accordance with (4)(c)(iii). Monitor 8-hr TWA annually.

Footnote (*) Exposure Scenario, Limit Exceeded: += Yes, - = No.

Footnote (**) The employer may decrease the frequency of exposure monitoring to annually when at least 2 consecutive measurements taken at least 7 days apart show exposures to be below the 8-hr TWA, but at or above the action level.

(iv) Monitoring techniques: Appendix D describes the validated method of sampling and analysis which has been tested by OSHA for use with BD. The employer has the obligation of selecting a monitoring method which meets the accuracy and precision requirements of the standard under his or her unique field conditions. The standard requires that the method of monitoring must be accurate, to a 95 percent confidence level, to plus or minus 25 percent for concentrations of BD at or above 1 ppm, and to plus or minus 35 percent for concentrations below 1 ppm.

(5) Personal Protective Equipment.

(a) Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent the skin from becoming frozen from contact with liquid BD.

(b) Any clothing which becomes wet with liquid BD should be removed immediately and not re-worn until the butadiene has evaporated.

(c) Employees should be provided with and required to use splash proof safety goggles where liquid BD may contact the eyes.

(6) Housekeeping and Hygiene Facilities.

For purposes of complying with WAC 296-24-120 (Part B-1 Sanitation), the following items should be emphasized:

(a) The workplace should be kept clean, orderly, and in a sanitary condition.

(b) Adequate washing facilities with hot and cold water are to be provided and maintained in a sanitary condition.

(7) Additional Precautions.

(a) Store BD in tightly closed containers in a cool, well-ventilated area and take all necessary precautions to avoid any explosion hazard.

(b) Nonsparking tools must be used to open and close metal containers. These containers must be effectively grounded.

(c) Do not incinerate BD cartridges, tanks or other containers.

(d) Employers must advise employees of all areas and operations where exposure to BD might occur.

Appendix C. Medical Screening and Surveillance for 1,3-Butadiene (Nonmandatory)

(1) Basis for Medical Screening and Surveillance Requirements.

(a) Route of Entry Inhalation.

(b) Toxicology.

Inhalation of BD has been linked to an increased risk of cancer, damage to the reproductive organs, and fetotoxicity. Butadiene can be converted via oxidation to epoxybutene and diepoxybutane, two genotoxic metabolites that may play a role in the expression of BD's toxic effects. BD has been tested for carcinogenicity in mice and rats. Both species responded to BD exposure by developing cancer at multiple primary organ sites. Early deaths in mice were caused by malignant lymphomas, primarily lymphocytic type, originating in the thymus.

Mice exposed to BD have developed ovarian or testicular atrophy. Sperm head morphology tests also revealed abnormal sperm in mice exposed to BD; lethal mutations were found in a dominant lethal test. In light of these results in animals, the possibility that BD may adversely affect the reproductive systems of male and female workers must be considered.

Additionally, anemia has been observed in animals exposed to butadiene. In some cases, this anemia appeared to be a primary response to exposure; in other cases, it may have been secondary to a neoplastic response.

(c) Epidemiology.

Epidemiologic evidence demonstrates that BD exposure poses an increased risk of leukemia. Mild alterations of hematologic parameters have also been observed in synthetic rubber workers exposed to BD.

(2) Potential Adverse Health Effects.

(a) Acute.

Skin contact with liquid BD causes characteristic burns or frostbite. BD in gaseous form can irritate the eyes, nasal passages, throat, and lungs. Blurred vision, coughing, and drowsiness may also occur. Effects are mild at 2,000 ppm and pronounced at 8,000 ppm for exposures occurring over the full workshift.

At very high concentrations in air, BD is an anesthetic, causing narcosis, respiratory paralysis, unconsciousness, and death. Such concentrations are unlikely, however, except in an extreme emergency because BD poses an explosion hazard at these levels.

(b) Chronic.

The principal adverse health effects of concern are BD-induced lymphoma, leukemia and potential reproductive toxicity. Anemia and other changes in the peripheral blood cells may be indicators of excessive exposure to BD.

(c) Reproductive.

Workers may be concerned about the possibility that their BD exposure may be affecting their ability to procreate a healthy child. For workers with high exposures to BD, especially those who have experienced difficulties in conceiving, miscarriages, or stillbirths, appropriate medical and laboratory evaluation of fertility may be necessary to determine if

BD is having any adverse effect on the reproductive system or on the health of the fetus.

(3) Medical Screening Components At-A-Glance.

(a) Health Questionnaire.

The most important goal of the health questionnaire is to elicit information from the worker regarding potential signs or symptoms generally related to leukemia or other blood abnormalities. Therefore, physicians or other licensed health care professionals should be aware of the presenting symptoms and signs of lymphohematopoietic disorders and cancers, as well as the procedures necessary to confirm or exclude such diagnoses. Additionally, the health questionnaire will assist with the identification of workers at greatest risk of developing leukemia or adverse reproductive effects from their exposures to BD.

Workers with a history of reproductive difficulties or a personal or family history of immune deficiency syndromes, blood dyscrasias, lymphoma, or leukemia, and those who are or have been exposed to medicinal drugs or chemicals known to affect the hematopoietic or lymphatic systems may be at higher risk from their exposure to BD. After the initial administration, the health questionnaire must be updated annually.

(b) Complete Blood Count (CBC).

The medical screening and surveillance program requires an annual CBC, with differential and platelet count, to be provided for each employee with BD exposure. This test is to be performed on a blood sample obtained by phlebotomy of the venous system or, if technically feasible, from a fingerstick sample of capillary blood. The sample is to be analyzed by an accredited laboratory.

Abnormalities in a CBC may be due to a number of different etiologies. The concern for workers exposed to BD includes, but is not limited to, timely identification of lymphohematopoietic cancers, such as leukemia and non-Hodgkin's lymphoma. Abnormalities of portions of the CBC are identified by comparing an individual's results to those of an established range of normal values for males and females. A substantial change in any individual employee's CBC may also be viewed as "abnormal" for that individual even if all measurements fall within the population-based range of normal values. It is suggested that a flowsheet for laboratory values be included in each employee's medical record so that comparisons and trends in annual CBCs can be easily made.

A determination of the clinical significance of an abnormal CBC shall be the responsibility of the examining physician, other licensed health care professional, or medical specialist to whom the employee is referred. Ideally, an abnormal CBC should be compared to previous CBC measurements for the same employee, when available. Clinical common sense may dictate that a CBC value that is very slightly outside the normal range does not warrant medical concern. A CBC abnormality may also be the result of a temporary physical stressor, such as a transient viral illness, blood donation, or menorrhagia, or laboratory error. In these cases, the CBC should be repeated in a timely fashion, i.e., within 6 weeks, to verify that return to the normal range has occurred. A clinically significant abnormal CBC should result in removal of the employee from further exposure to

BD. Transfer of the employee to other work duties in a BD-free environment would be the preferred recommendation.

(c) Physical Examination.

The medical screening and surveillance program requires an initial physical examination for workers exposed to BD; this examination is repeated once every three years. The initial physical examination should assess each worker's baseline general health and rule out clinical signs of medical conditions that may be caused by or aggravated by occupational BD exposure. The physical examination should be directed at identification of signs of lymphohematopoietic disorders, including lymph node enlargement, splenomegaly, and hepatomegaly.

Repeated physical examinations should update objective clinical findings that could be indicative of interim development of a lymphohematopoietic disorder, such as lymphoma, leukemia, or other blood abnormality. Physical examinations may also be provided on an as needed basis in order to follow up on a positive answer on the health questionnaire, or in response to an abnormal CBC. Physical examination of workers who will no longer be working in jobs with BD exposure are intended to rule out lymphohematopoietic disorders.

The need for physical examinations for workers concerned about adverse reproductive effects from their exposure to BD should be identified by the physician or other licensed health care professional and provided accordingly. For these workers, such consultations and examinations may relate to developmental toxicity and reproductive capacity.

Physical examination of workers acutely exposed to significant levels of BD should be especially directed at the respiratory system, eyes, sinuses, skin, nervous system, and any region associated with particular complaints. If the worker has received a severe acute exposure, hospitalization may be required to assure proper medical management. Since this type of exposure may place workers at greater risk of blood abnormalities, a CBC must be obtained within 48 hours and repeated at one, two, and three months.

Appendix D: Sampling and Analytical Method for 1,3-Butadiene (Non-Mandatory)

OSHA Method No.: 56.

Matrix: Air.

Target concentration: 1 ppm (2.21 ug/m³).

Procedure: Air samples are collected by drawing known volumes of air through sampling tubes containing charcoal adsorbent which has been coated with 4-tert-butylcatechol. The samples are desorbed with carbon disulfide and then analyzed by gas chromatography using a flame ionization detector.

Recommended sampling rate and air volume: 0.05 L/min and 3 L.

Detection limit of the overall procedure: 90 ppb (200 ug/m³) (based on 3 L air volume).

Reliable quantitation limit: 155 ppb (343 ug/m³) (based on 3 L air volume).

Standard error of estimate at the target concentration: 6.5%.

Special requirements: The sampling tubes must be coated with 4-tert-butylcatechol. Collected samples should be stored in a freezer.

Status of method: A sampling and analytical method has been subjected to the established evaluation procedures of the Organic Methods Evaluation Branch, OSHA Analytical Laboratory, Salt Lake City, Utah 84165.

(1) Background.

This work was undertaken to develop a sampling and analytical procedure for BD at 1 ppm. The current method recommended by OSHA for collecting BD uses activated coconut shell charcoal as the sampling medium (Ref. 5.2). This method was found to be inadequate for use at low BD levels because of sample instability.

The stability of samples has been significantly improved through the use of a specially cleaned charcoal which is coated with 4-tert-butylcatechol (TBC). TBC is a polymerization inhibitor for BD (Ref. 5.3).

(a) Toxic effects.

Symptoms of human exposure to BD include irritation of the eyes, nose and throat. It can also cause coughing, drowsiness and fatigue. Dermatitis and frostbite can result from skin exposure to liquid BD. (Ref. 5.1)

NIOSH recommends that BD be handled in the workplace as a potential occupational carcinogen. This recommendation is based on two inhalation studies that resulted in cancers at multiple sites in rats and in mice. BD has also demonstrated mutagenic activity in the presence of a liver microsomal activating system. It has also been reported to have adverse reproductive effects. (Ref. 5.1)

(b) Potential workplace exposure.

About 90% of the annual production of BD is used to manufacture styrene-butadiene rubber and Polybutadiene rubber. Other uses include: Polychloroprene rubber, acrylonitrile butadiene-styrene resins, nylon intermediates, styrene-butadiene latexes, butadiene polymers, thermoplastic elastomers, nitrile resins, methyl methacrylate-butadiene styrene resins and chemical intermediates. (Ref. 5.1)

(c) Physical properties (Ref. 5.1).

CAS No.: 106-99-0

Molecular weight: 54.1

Appearance: Colorless gas

Boiling point: -4.41 deg. C (760 mm Hg)

Freezing point: -108.9 deg. C

Vapor pressure: 2 atm (a) 15.3 deg. C; 5 atm (a) 47 deg.

C

Explosive limits: 2 to 11.5% (by volume in air)

Odor threshold: 0.45 ppm

Structural formula: H(2)C:CHCH:CH(2)

Synonyms: BD; biethylene; bivinyl; butadiene; divinyl; buta-1,3-diene; alpha-gamma-butadiene; erythrene; NCI-C50602; pyrrolylene; vinylethylene.

(d) Limit defining parameters.

The analyte air concentrations listed throughout this method are based on an air volume of 3 L and a desorption volume of 1 mL. Air concentrations listed in ppm are referenced to 25 deg. C and 760 mm Hg.

(e) Detection limit of the analytical procedure.

The detection limit of the analytical procedure was 304 pg per injection. This was the amount of BD which gave a response relative to the interferences present in a standard.

(f) Detection limit of the overall procedure.

The detection limit of the overall procedure was 0.60 ug per sample (90 ppb or 200 ug/m³). This amount was determined graphically. It was the amount of analyte which, when spiked on the sampling device, would allow recovery approximately equal to the detection limit of the analytical procedure.

(g) Reliable quantitation limit.

The reliable quantitation limit was 1.03 ug per sample (155 ppb or 343 ug/m³). This was the smallest amount of analyte which could be quantitated within the limits of a recovery of at least 75% and a precision (+/- 1.96 SD) of +/- 25% or better.

(h) Sensitivity.(1)

Footnote (1) The reliable quantitation limit and detection limits reported in the method are based upon optimization of the instrument for the smallest possible amount of analyte. When the target concentration of an analyte is exceptionally higher than these limits, they may not be attainable at the routine operation parameters.

The sensitivity of the analytical procedure over a concentration range representing 0.6 to 2 times the target concentration, based on the recommended air volume, was 387 area units per ug/mL. This value was determined from the slope of the calibration curve. The sensitivity may vary with the particular instrument used in the analysis.

(i) Recovery.

The recovery of BD from samples used in storage tests remained above 77% when the samples were stored at ambient temperature and above 94% when the samples were stored at refrigerated temperature. These values were determined from regression lines which were calculated from the storage data. The recovery of the analyte from the collection device must be at least 75% following storage.

(j) Precision (analytical method only).

The pooled coefficient of variation obtained from replicate determinations of analytical standards over the range of 0.6 to 2 times the target concentration was 0.011.

(k) Precision (overall procedure).

The precision at the 95% confidence level for the refrigerated temperature storage test was +/- 12.7%. This value includes an additional +/- 5% for sampling error. The overall procedure must provide results at the target concentrations that are +/- 25% at the 95% confidence level.

(l) Reproducibility.

Samples collected from a controlled test atmosphere and a draft copy of this procedure were given to a chemist unassociated with this evaluation. The average recovery was 97.2% and the standard deviation was 6.2%.

(2) Sampling procedure.

(a) Apparatus. Samples are collected by use of a personal sampling pump that can be calibrated to within +/- 5% of the recommended 0.05 L/min sampling rate with the sampling tube in line.

(b) Samples are collected with laboratory prepared sampling tubes. The sampling tube is constructed of silane-treated glass and is about 5-cm long. The ID is 4 mm and the OD is 6 mm. One end of the tube is tapered so that a glass

wool end plug will hold the contents of the tube in place during sampling. The opening in the tapered end of the sampling tube is at least one-half the ID of the tube (2 mm). The other end of the sampling tube is open to its full 4-mm ID to facilitate packing of the tube. Both ends of the tube are fire-polished for safety. The tube is packed with 2 sections of pre-treated charcoal which has been coated with TBC. The tube is packed with a 50-mg backup section, located nearest the tapered end, and with a 100-mg sampling section of charcoal. The two sections of coated adsorbent are separated and retained with small plugs of silanized glass wool. Following packing, the sampling tubes are sealed with two 7/32 inch OD plastic end caps. Instructions for the pretreatment and coating of the charcoal are presented in Section 4.1 of this method.

(c) Reagents.

None required.

(d) Technique.

(i) Properly label the sampling tube before sampling and then remove the plastic end caps.

(ii) Attach the sampling tube to the pump using a section of flexible plastic tubing such that the larger front section of the sampling tube is exposed directly to the atmosphere. Do not place any tubing ahead of the sampling tube. The sampling tube should be attached in the worker's breathing zone in a vertical manner such that it does not impede work performance.

(iii) After sampling for the appropriate time, remove the sampling tube from the pump and then seal the tube with plastic end caps. Wrap the tube lengthwise.

(iv) Include at least one blank for each sampling set. The blank should be handled in the same manner as the samples with the exception that air is not drawn through it.

(v) List any potential interferences on the sample data sheet.

(vi) The samples require no special shipping precautions under normal conditions. The samples should be refrigerated if they are to be exposed to higher than normal ambient temperatures. If the samples are to be stored before they are shipped to the laboratory, they should be kept in a freezer. The samples should be placed in a freezer upon receipt at the laboratory.

(e) Breakthrough.

(Breakthrough was defined as the relative amount of analyte found on the backup section of the tube in relation to the total amount of analyte collected on the sampling tube. Five-percent breakthrough occurred after sampling a test atmosphere containing 2.0 ppm BD for 90 min. at 0.05 L/min. At the end of this time 4.5 L of air had been sampled and 20.1 ug of the analyte was collected. The relative humidity of the sampled air was 80% at 23 deg. C.)

Breakthrough studies have shown that the recommended sampling procedure can be used at air concentrations higher than the target concentration. The sampling time, however, should be reduced to 45 min. if both the expected BD level and the relative humidity of the sampled air are high.

(f) Desorption efficiency.

The average desorption efficiency for BD from TBC coated charcoal over the range from 0.6 to 2 times the target

concentration was 96.4%. The efficiency was essentially constant over the range studied.

(g) Recommended air volume and sampling rate.

(h) The recommended air volume is 3 L.

(i) The recommended sampling rate is 0.05 L/min. for 1 hour.

(j) Interferences.

There are no known interferences to the sampling method.

(k) Safety precautions.

(i) Attach the sampling equipment to the worker in such a manner that it will not interfere with work performance or safety.

(ii) Follow all safety practices that apply to the work area being sampled.

(3) Analytical procedure.

(a) Apparatus.

(i) A gas chromatograph (GC), equipped with a flame ionization detector (FID).(2)

Footnote (2) A Hewlett-Packard Model 5840A GC was used for this evaluation. Injections were performed using a Hewlett-Packard Model 7671A automatic sampler.

(ii) A GC column capable of resolving the analytes from any interference.(3)

Footnote (3) A 20-ft x 1/8-inch OD stainless steel GC column containing 20% FFAP on 80/100 mesh Chromabsorb W-AW-DMCS was used for this evaluation.

(iii) Vials, glass 2-mL with Teflon-lined caps.

(iv) Disposable Pasteur-type pipets, volumetric flasks, pipets and syringes for preparing samples and standards, making dilutions and performing injections.

(b) Reagents.

(i) Carbon disulfide.(4)

Footnote (4) Fisher Scientific Company A.C.S. Reagent Grade solvent was used in this evaluation.

The benzene contaminant that was present in the carbon disulfide was used as an internal standard (ISTD) in this evaluation.

(ii) Nitrogen, hydrogen and air, GC grade.

(iii) BD of known high purity.(5)

Footnote (5) Matheson Gas Products, CP Grade 1,3-butadiene was used in this study.

(c) Standard preparation.

(i) Prepare standards by diluting known volumes of BD gas with carbon disulfide. This can be accomplished by injecting the appropriate volume of BD into the headspace above the 1-mL of carbon disulfide contained in sealed 2-mL vial. Shake the vial after the needle is removed from the septum.(6)

Footnote (6) A standard containing 7.71 ug/mL (at ambient temperature and pressure) was prepared by diluting 4 uL of the gas with 1-mL of carbon disulfide.

(ii) The mass of BD gas used to prepare standards can be determined by use of the following equations:

$$MV = (760/BP)(273+t)/(273)(22.41)$$

Where:

MV = ambient molar volume

BP = ambient barometric pressure

T = ambient temperature

ug/uL = 54.09/MV

ug/standard = (ug/uL)(uL) BD used to prepare the standard

(d) Sample preparation.

(i) Transfer the 100-mg section of the sampling tube to a 2-mL vial. Place the 50-mg section in a separate vial. If the glass wool plugs contain a significant amount of charcoal, place them with the appropriate sampling tube section.

(ii) Add 1-mL of carbon disulfide to each vial.

(iii) Seal the vials with Teflon-lined caps and then allow them to desorb for one hour. Shake the vials by hand vigorously several times during the desorption period.

(iv) If it is not possible to analyze the samples within 4 hours, separate the carbon disulfide from the charcoal, using a disposable Pasteur-type pipet, following the one hour. This separation will improve the stability of desorbed samples.

(v) Save the used sampling tubes to be cleaned and repacked with fresh adsorbent.

(e) Analysis.

(i) GC Conditions.

Column temperature: 95 deg. C

Injector temperature: 180 deg. C

Detector temperature: 275 deg. C

Carrier gas flow rate: 30 mL/min.

Injection volume: 0.80 uL

GC column: 20-ft x 1/8-in OD stainless steel GC column containing 20%

FFAP on 80/100 Chromabsorb W-AW-DMCS.

(ii) Chromatogram. See Section 4.2.

(iii) Use a suitable method, such as electronic or peak heights, to measure detector response.

(iv) Prepare a calibration curve using several standard solutions of different concentrations. Prepare the calibration curve daily. Program the integrator to report the results in ug/mL.

(v) Bracket sample concentrations with standards.

(f) Interferences (analytical).

(i) Any compound with the same general retention time as the analyte and which also gives a detector response is a potential interference. Possible interferences should be reported by the industrial hygienist to the laboratory with submitted samples.

(ii) GC parameters (temperature, column, etc.) may be changed to circumvent interferences.

(iii) A useful means of structure designation is GC/MS. It is recommended that this procedure be used to confirm samples whenever possible.

(g) Calculations.

(i) Results are obtained by use of calibration curves. Calibration curves are prepared by plotting detector response against concentration for each standard. The best line through the data points is determined by curve fitting.

(ii) The concentration, in ug/mL, for a particular sample is determined by comparing its detector response to the calibration curve. If any analyte is found on the backup section, this amount is added to the amount found on the front section. Blank corrections should be performed before adding the results together.

(iii) The BD air concentration can be expressed using the following equation:

$$\text{mg/m}^3 = (A)(B)/(C)(D)$$

Where:

A = ug/mL from Section 3.7.2

B = volume

C = L of air sampled

D = efficiency

(iv) The following equation can be used to convert results in mg/m(3) to ppm:

$$\text{ppm} = (\text{mg/m}(3))(24.46)/54.09$$

Where:

mg/m(3) = result from Section 3.7.3.

24.46 = molar volume of an ideal gas at 760 mm Hg and 25 deg. C.

(h) Safety precautions (analytical).

(i) Avoid skin contact and inhalation of all chemicals.

(ii) Restrict the use of all chemicals to a fume hood whenever possible.

(iii) Wear safety glasses and a lab coat in all laboratory areas.

(4) Additional Information.

(a) A procedure to prepare specially cleaned charcoal coated with TBC.

(i) Apparatus.

(A) Magnetic stirrer and stir bar.

(B) Tube furnace capable of maintaining a temperature of 700 deg. C and equipped with a quartz tube that can hold 30 g of charcoal.(8)

Footnote (8) A Lindberg Type 55035 Tube furnace was used in this evaluation.

(C) A means to purge nitrogen gas through the charcoal inside the quartz tube.

(D) Water bath capable of maintaining a temperature of 60 deg. C.

(E) Miscellaneous laboratory equipment: One-liter vacuum flask, 1-L Erlenmeyer flask, 350-M1 Buchner funnel with a coarse fitted disc, 4-oz brown bottle, rubber stopper, Teflon tape etc.

(ii) Reagents.

(A) Phosphoric acid, 10% by weight, in water.(9)

Footnote (9) Baker Analyzed Reagent grade was diluted with water for use in this evaluation.

(B) 4-tert-Butylcatechol (TBC).(10)

Footnote (10) The Aldrich Chemical Company 99% grade was used in this evaluation.

(C) Specially cleaned coconut shell charcoal, 20/40 mesh.(11)

Footnote (11) Specially cleaned charcoal was obtained from Supelco, Inc. for use in this evaluation. The cleaning process used by Supelco is proprietary.

(D) Nitrogen gas, GC grade.

(iii) Procedure.

Weigh 30g of charcoal into a 500-mL Erlenmeyer flask. Add about 250 mL of 10% phosphoric acid to the flask and then swirl the mixture. Stir the mixture for 1 hour using a magnetic stirrer. Filter the mixture using a fitted Buchner funnel. Wash the charcoal several times with 250-mL portions of deionized water to remove all traces of the acid. Transfer the washed charcoal to the tube furnace quartz tube. Place the quartz tube in the furnace and then connect the nitrogen gas purge to the tube. Fire the charcoal to 700 deg.

(2001 Ed.)

C. Maintain that temperature for at least 1 hour. After the charcoal has cooled to room temperature, transfer it to a tared beaker. Determine the weight of the charcoal and then add an amount of TBC which is 10% of the charcoal, by weight.

CAUTION-TBC is toxic and should only be handled in a fume hood while wearing gloves.

Carefully mix the contents of the beaker and then transfer the mixture to a 4-oz bottle. Stopper the bottle with a clean rubber stopper which has been wrapped with Teflon tape. Clamp the bottle in a water bath so that the water level is above the charcoal level. Gently heat the bath to 60 deg. C and then maintain that temperature for 1 hour. Cool the charcoal to room temperature and then transfer the coated charcoal to a suitable container.

The coated charcoal is now ready to be packed into sampling tubes. The sampling tubes should be stored in a sealed container to prevent contamination. Sampling tubes should be stored in the dark at room temperature. The sampling tubes should be segregated by coated adsorbent lot number.

(b) Chromatograms.

The chromatograms were obtained using the recommended analytical method. The chart speed was set at 1 cm/min. for the first three min. and then at 0.2 cm/min. for the time remaining in the analysis.

The peak which elutes just before BD is a reaction product between an impurity on the charcoal and TBC. This peak is always present, but it is easily resolved from the analyte. The peak which elutes immediately before benzene is an oxidation product of TBC.

(5) References.

(a) "Current Intelligence Bulletin 41, 1,3-Butadiene", U.S. Dept. of Health and Human Services, Public Health Service, Center for Disease Control, NIOSH.

(b) "NIOSH Manual of Analytical Methods", 2nd ed.; U.S. Dept. of Health Education and Welfare, National Institute for Occupational Safety and Health: Cincinnati, OH, 1977, Vol. 2, Method No. S91 DHEW (NIOSH) Publ. (U.S.), No. 77-157-B.

(c) Hawley, G.C., Ed. "The Condensed Chemical Dictionary", 8th ed.; Van Nostrand Reinhold Company: New York, 1971; 139.5.4. Chem. Eng. News (June 10, 1985), (63), 22-66.

Appendix E: Reserved.

APPENDIX F, MEDICAL QUESTIONNAIRES, (Non-mandatory)

1,3-Butadiene (BD) Initial Health Questionnaire

DIRECTIONS:

You have been asked to answer the questions on this form because you work with BD (butadiene). These questions are about your work, medical history, and health concerns. Please do your best to answer all of the questions. If you need help, please tell the doctor or health care professional who reviews this form.

This form is a confidential medical record. Only information directly related to your health and safety on the job may be given to your employer. Personal health information will not be given to anyone without your consent.

Date: _____
 Name: _____ SSN ___/___/___
 Last First MI
 Job Title: _____
 Company's Name: _____
 Supervisor's Name: _____
 Supervisor's Phone No.: () ___-____

Work History

1. Please list all jobs you have had in the past, starting with the job you have now and moving back in time to your first job. (For more space, write on the back of this page.)

Main Job Duty _____
 Year _____
 Company Name _____
 City, State _____

Chemicals

- 1. _____
 - 2. _____
 - 3. _____
 - 4. _____
 - 5. _____
 - 6. _____
 - 7. _____
 - 8. _____
2. Please describe what you do during a typical work day. Be sure to tell about your work with BD.
- _____
- _____
- _____

3. Please check any of these chemicals that you work with now or have worked with in the past:

- benzene _____
- glues _____
- toluene _____
- inks, dyes _____
- other solvents, grease cutters _____
- insecticides (like DDT, lindane, etc.) _____
- paints, varnishes, thinners, strippers _____
- dusts _____
- carbon tetrachloride ("carbon tet") _____
- arsine _____
- carbon disulfide _____
- lead _____
- cement _____
- petroleum products _____
- nitrites _____

4. Please check the protective clothing or equipment you use at the job you have now:

- gloves _____
- coveralls _____
- respirator _____
- dust mask _____
- safety glasses, goggles _____

Please circle your answer.

- 5. Does your protective clothing or equipment fit you properly? yes no
 - 6. Have you ever made changes in your protective clothing or equipment to make it fit better? yes no
 - 7. Have you been exposed to BD when you were not wearing protective clothing or equipment? yes no
 - 8. Where do you eat, drink and/or smoke when you are at work? (Please check all that apply.)
- Cafeteria/restaurant/snack bar _____
 - Break room/employee lounge _____
 - Smoking lounge _____
 - At my work station _____

Please circle your answer.

- 9. Have you been exposed to radiation (like x-rays or nuclear material) at the job you have now or at past jobs? yes no
- 10. Do you have any hobbies that expose you to dusts or chemicals (including paints, glues, etc.)? yes no
- 11. Do you have any second or side jobs? yes no
 If yes, what are your duties there?

- 12. Were you in the military? yes no
- If yes, what did you do in the military? _____

Family Health History

1. In the FAMILY MEMBER column, across from the disease name, write which family member, if any, had the disease.

DISEASE	FAMILY MEMBER
Cancer	_____
Lymphoma	_____
Sickle Cell Disease or Trait	_____
Immune Disease	_____
Leukemia	_____
Anemia	_____

2. Please fill in the following information about family health

- Relative _____
- Alive? _____
- Age at Death? _____
- Cause of Death? _____
- Father _____
- Mother _____
- Brother/Sister _____
- Brother/Sister _____
- Brother/Sister _____

Personal Health History

Birth Date ___/___/___ Age ___ Sex ___ Height ___ Weight ___

Please circle your answer.

- 1. Do you smoke any tobacco products? yes no
- 2. Have you ever had any kind of surgery or operation?
yes no

If yes, what type of surgery:

- 3. Have you ever been in the hospital for any other reasons? yes no

If yes, please describe the reason

- 4. Do you have any on-going or current medical problems or conditions? yes no

If yes, please describe:

- 5. Do you now have or have you ever had any of the following? Please check all that apply to you.

- unexplained fever _____
- anemia ("low blood") _____
- HIV/AIDS _____
- weakness _____
- sickle cell _____
- miscarriage _____
- skin rash _____
- bloody stools _____
- leukemia/lymphoma _____
- neck mass/swelling _____
- wheezing _____
- yellowing of skin _____
- bruising easily _____
- lupus _____
- weight loss _____
- kidney problems _____
- enlarged lymph nodes _____
- liver disease _____
- cancer _____
- infertility _____
- drinking problems _____
- thyroid problems _____
- night sweats _____
- chest pain _____
- still birth _____
- eye redness _____
- lumps you can feel _____
- child with birth defect _____
- autoimmune disease _____
- overly tired _____
- lung problems _____
- rheumatoid arthritis _____
- mononucleosis ("mono") _____

nagging cough _____

Please circle your answer.

- 6. Do you have any symptoms or health problems that you think may be related to your work with BD? yes no

If yes, please describe: _____

- 7. Have any of your co-workers had similar symptoms or problems? yes no don't know

If yes, please describe: _____

- 8. Do you notice any irritation of your eyes, nose, throat, lungs, or skin when working with BD? yes no

- 9. Do you notice any blurred vision, coughing, drowsiness, nausea, or headache when working with BD? yes no

- 10. Do you take any medications (including birth control or over-the-counter)? yes no

If yes, please list: _____

- 11. Are you allergic to any medication, food, or chemicals? yes no

If yes, please list: _____

- 12. Do you have any health conditions not covered by this questionnaire that you think are affected by your work with BD? yes no

If yes, please explain: _____

- 13. Did you understand all the questions? yes no

Signature _____

1,3-Butadiene (BD) Health Update Questionnaire

DIRECTIONS:

You have been asked to answer the questions on this form because you work with BD (butadiene). These questions are about your work, medical history, and health concerns. Please do your best to answer all of the questions. If you need help, please tell the doctor or health care professional who reviews this form.

This form is a confidential medical record. Only information directly related to your health and safety on the job may be given to your employer. Personal health information will not be given to anyone without your consent.

Date: _____

Name: _____ SSN ___/___/___

Last First MI

Job Title: _____

Company's Name: _____

Supervisor's Name: _____

Supervisor's Phone No.: () ___-____

1. Please describe any NEW duties that you have at your job. _____

2. Please describe any additional job duties you have:

Please circle your answer.

3. Are you exposed to any other chemicals in your work since the last time you were evaluated for exposure to BD? yes no

If yes, please list what they are: _____

4. Does your personal protective equipment and clothing fit you properly? yes no

5. Have you made changes in this equipment or clothing to make it fit better? yes no

6. Have you been exposed to BD when you were not wearing protective clothing or equipment? yes no

7. Are you exposed to any NEW chemicals at home or while working on hobbies? yes no

If yes, please list what they are: _____

8. Since your last BD health evaluation, have you started working any new second or side jobs? yes no

If yes, what are your duties there? _____

Personal Health History

1. What is your current weight? ____ pounds

2. Have you been diagnosed with any new medical conditions or illness since your last evaluation? yesno

If yes, please tell what they are: _____

3. Since your last evaluation, have you been in the hospital for any illnesses, injuries, or surgery? yes no

If yes, please describe: _____

4. Do you have any of the following? Please place a check for all that apply to you.

- unexplained fever _____
- anemia ("low blood") _____
- HIV/AIDS _____
- weakness _____
- sickle cell _____

- miscarriage _____
- skin rash _____
- bloody stools _____
- leukemia/lymphoma _____
- neck mass/swelling _____
- wheezing _____
- yellowing of skin _____
- bruising easily _____
- lupus _____
- weight loss _____
- kidney problems _____
- enlarged lymph nodes _____
- liver disease _____
- cancer _____
- infertility _____
- drinking problems _____
- thyroid problems _____
- night sweats _____
- chest pain _____
- still birth _____
- eye redness _____
- lumps you can feel _____
- child with birth defect _____
- autoimmune disease _____
- overly tired _____
- lung problems _____
- rheumatoid arthritis _____
- mononucleosis ("mono") _____
- nagging cough _____

Please circle your answer.

5. Do you have any symptoms or health problems that you think may be related to your work with BD? yes no

If yes, please describe: _____

6. Have any of your co-workers had similar symptoms or problems? yes no don't know

If yes, please describe: _____

7. Do you notice any irritation of your eyes, nose, throat, lungs, or skin when working with BD? yes no

8. Do you notice any blurred vision, coughing, drowsiness, nausea, or headache when working with BD? yes no

9. Have you been taking any NEW medications (including birth control or over-the-counter)? yes no

If yes, please list:

10. Have you developed any new allergies to medications, foods, or chemicals? yes no

If yes, please list:

11. Do you have any health conditions not covered by this questionnaire that you think are affected by your work with BD? yes no

If yes, please explain: _____

12. Do you understand all the questions? yes no

Signature _____

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-10-071, § 296-62-07460, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060, 97-19-014, § 296-62-07460, filed 9/5/97, effective 11/5/97.]

WAC 296-62-07470 Methylene chloride. This occupational health standard establishes requirements for employers to control occupational exposure to methylene chloride (MC). Employees exposed to MC are at increased risk of developing cancer, adverse effects on the heart, central nervous system and liver, and skin or eye irritation. Exposure may occur through inhalation, by absorption through the skin, or through contact with the skin. MC is a solvent which is used in many different types of work activities, such as paint stripping, polyurethane foam manufacturing, and cleaning and degreasing. Under the requirements of subsection (4) of this section, each covered employer must make an initial determination of each employee's exposure to MC. If the employer determines that employees are exposed below the action level, the only other provisions of this section that apply are that a record must be made of the determination, the employees must receive information and training under subsection (12) of this section and, where appropriate, employees must be protected from contact with liquid MC under subsection (8) of this section.

The provisions of the MC standard are as follows:

(1) Scope and application. This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment.

(2) Definitions. For the purposes of this section, the following definitions shall apply:

"Action level" means a concentration of airborne MC of 12.5 parts per million (ppm) calculated as an eight (8)-hour time-weighted average (TWA).

"Authorized person" means any person specifically authorized by the employer and required by work duties to be present in regulated areas, or any person entering such an area as a designated representative of employees for the purpose of exercising the right to observe monitoring and measuring procedures under subsection (4) of this section, or any other person authorized by the WISH Act or regulations issued under the act.

"Director" means the director of the department of labor and industries, or designee.

"Emergency" means any occurrence, such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment, which results, or is likely to result in an uncontrolled release of MC. If an incidental release of MC can be controlled by employees such as maintenance personnel at the time of release and in accordance with the leak/spill

provisions required by subsection (6) of this section, it is not considered an emergency as defined by this standard.

"Employee exposure" means exposure to airborne MC which occurs or would occur if the employee were not using respiratory protection.

"Methylene chloride (MC)" means an organic compound with chemical formula, CH₂Cl₂. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole.

"Physician or other licensed health care professional" is an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the health care services required by subsection (10) of this section.

"Regulated area" means an area, demarcated by the employer, where an employee's exposure to airborne concentrations of MC exceeds or can reasonably be expected to exceed either the 8-hour TWA PEL or the STEL.

"Symptom" means central nervous system effects such as headaches, disorientation, dizziness, fatigue, and decreased attention span; skin effects such as chapping, erythema, cracked skin, or skin burns; and cardiac effects such as chest pain or shortness of breath.

"This section" means this methylene chloride standard.

(3) Permissible exposure limits (PELs).

(a) Eight-hour time-weighted average (TWA) PEL. The employer shall ensure that no employee is exposed to an airborne concentration of MC in excess of twenty-five parts of MC per million parts of air (25 ppm) as an 8-hour TWA.

(b) Short-term exposure limit (STEL). The employer shall ensure that no employee is exposed to an airborne concentration of MC in excess of one hundred and twenty-five parts of MC per million parts of air (125 ppm) as determined over a sampling period of fifteen minutes.

(4) Exposure monitoring.

(a) Characterization of employee exposure.

(i) Where MC is present in the workplace, the employer shall determine each employee's exposure by either:

(A) Taking a personal breathing zone air sample of each employee's exposure; or

(B) Taking personal breathing zone air samples that are representative of each employee's exposure.

(ii) Representative samples. The employer may consider personal breathing zone air samples to be representative of employee exposures when they are taken as follows:

(A) 8-hour TWA PEL. The employer has taken one or more personal breathing zone air samples for at least one employee in each job classification in a work area during every work shift, and the employee sampled is expected to have the highest MC exposure.

(B) Short-term exposure limits. The employer has taken one or more personal breathing zone air samples which indicate the highest likely 15-minute exposures during such operations for at least one employee in each job classification in the work area during every work shift, and the employee sampled is expected to have the highest MC exposure.

(C) Exception. Personal breathing zone air samples taken during one work shift may be used to represent employee exposures on other work shifts where the employer

can document that the tasks performed and conditions in the workplace are similar across shifts.

(iii) Accuracy of monitoring. The employer shall ensure that the methods used to perform exposure monitoring produce results that are accurate to a confidence level of 95 percent, and are:

(A) Within plus or minus 25 percent for airborne concentrations of MC above the 8-hour TWA PEL or the STEL; or

(B) Within plus or minus 35 percent for airborne concentrations of MC at or above the action level but at or below the 8-hour TWA PEL.

(b) Initial determination. Each employer whose employees are exposed to MC shall perform initial exposure monitoring to determine each affected employee's exposure, except under the following conditions:

(i) Where objective data demonstrate that MC cannot be released in the workplace in airborne concentrations at or above the action level or above the STEL. The objective data shall represent the highest MC exposures likely to occur under reasonably foreseeable conditions of processing, use, or handling. The employer shall document the objective data exemption as specified in subsection (13) of this section;

(ii) Where the employer has performed exposure monitoring within 12 months prior to December 1, and that exposure monitoring meets all other requirements of this section, and was conducted under conditions substantially equivalent to existing conditions; or

(iii) Where employees are exposed to MC on fewer than 30 days per year (e.g., on a construction site), and the employer has measurements by direct reading instruments which give immediate results (such as a detector tube) and which provide sufficient information regarding employee exposures to determine what control measures are necessary to reduce exposures to acceptable levels.

(c) Periodic monitoring. Where the initial determination shows employee exposures at or above the action level or above the STEL, the employer shall establish an exposure monitoring program for periodic monitoring of employee exposure to MC in accordance with Table 1:

Table 1

Six Initial Determination Exposure Scenarios and Their Associated Monitoring Frequencies

<u>Exposure scenario</u>	<u>Required monitoring activity</u>
Below the action level and at or below the STEL.	No 8-hour TWA or STEL monitoring required.
Below the action level and above the STEL.	No 8-hour TWA monitoring required; monitor STEL exposures every three months.
At or above the action level, at or below the TWA, and at or below the STEL.	Monitor 8-hour TWA exposures every six months.
At or above the action level, at or below the TWA, and above the STEL.	Monitor 8-hour TWA exposures every six months and monitor STEL exposures every three months.

<u>Exposure scenario</u>	<u>Required monitoring activity</u>
Above the TWA and at or below the STEL.	Monitor 8-hour TWA exposures every three months. In addition, without regard to the last sentence of the note to subsection (3) of this section, the following employers must monitor STEL exposures every three months until either the date by which they must achieve the 8-hour TWAs PEL under subsection (3) of this section or the date by which they in fact achieve the 8-hour TWA PEL, whichever comes first: <ul style="list-style-type: none"> • Employers engaged in polyurethane foam manufacturing; • Foam fabrication; • Furniture refinishing; • General aviation aircraft stripping; • Product formulation; • Use of MC-based adhesives for boat building and repair; • Recreational vehicle manufacture, van conversion, or upholstery; and use of MC in construction work for restoration and preservation of buildings, painting and paint removal, cabinet making, or floor refinishing and resurfacing.
Above the TWA and above the STEL.	Monitor both 8-hour TWA exposures and STEL exposures every three months.

(Note to subsection (3)(c) of this section: The employer may decrease the frequency of exposure monitoring to every six months when at least 2 consecutive measurements taken at least 7 days apart show exposures to be at or below the 8-hour TWA PEL. The employer may discontinue the periodic 8-hour TWA monitoring for employees where at least two consecutive measurements taken at least 7 days apart are below the action level. The employer may discontinue the periodic STEL monitoring for employees where at least two consecutive measurements taken at least 7 days apart are at or below the STEL.)

(d) Additional monitoring.

(i) The employer shall perform exposure monitoring when a change in workplace conditions indicates that employee exposure may have increased. Examples of situations that may require additional monitoring include changes in production, process, control equipment, or work practices, or a leak, rupture, or other breakdown.

(ii) Where exposure monitoring is performed due to a spill, leak, rupture or equipment breakdown, the employer shall clean up the MC and perform the appropriate repairs before monitoring.

(e) Employee notification of monitoring results.

(i) The employer shall, within 15 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results in writing, either individually or by posting of results in an appropriate location that is accessible to affected employees.

(ii) Whenever monitoring results indicate that employee exposure is above the 8-hour TWA PEL or the STEL, the employer shall describe in the written notification the corrective action being taken to reduce employee exposure to or below the 8-hour TWA PEL or STEL and the schedule for completion of this action.

(f) Observation of monitoring.

(i) Employee observation. The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to MC conducted in accordance with this section.

(ii) Observation procedures. When observation of the monitoring of employee exposure to MC requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide, at no cost to the observer(s), and the observer(s) shall be required to use such clothing and equipment and shall comply with all other applicable safety and health procedures.

(5) Regulated areas.

(a) The employer shall establish a regulated area whenever an employee's exposure to airborne concentrations of MC exceeds or can reasonably be expected to exceed either the 8-hour TWA PEL or the STEL.

(b) The employer shall limit access to regulated areas to authorized persons.

(c) The employer shall supply a respirator, selected in accordance with subsection (7)(c) of this section, to each person who enters a regulated area and shall require each affected employee to use that respirator whenever MC exposures are likely to exceed the 8-hour TWA PEL or STEL.

(Note to subsection (5)(c) of this section: An employer who has implemented all feasible engineering, work practice and administrative controls (as required in subsection (6) of this section), and who has established a regulated area (as required by subsection (5)(a) of this section) where MC exposure can be reliably predicted to exceed the 8-hour TWA PEL or the STEL only on certain days (for example, because of work or process schedule) would need to have affected employees use respirators in that regulated area only on those days.)

(d) The employer shall ensure that, within a regulated area, employees do not engage in nonwork activities which may increase dermal or oral MC exposure.

(e) The employer shall ensure that while employees are wearing respirators, they do not engage in activities (such as taking medication or chewing gum or tobacco) which interfere with respirator seal or performance.

(f) The employer shall demarcate regulated areas from the rest of the workplace in any manner that adequately establishes and alerts employees to the boundaries of the area and minimizes the number of authorized employees exposed to MC within the regulated area.

(g) An employer at a multi-employer worksite who establishes a regulated area shall communicate the access

restrictions and locations of these areas to all other employers with work operations at that worksite.

(6) Methods of compliance.

(a) Engineering and work practice controls. The employer shall institute and maintain the effectiveness of engineering controls and work practices to reduce employee exposure to or below the PELs except to the extent that the employer can demonstrate that such controls are not feasible.

(b) Wherever the feasible engineering controls and work practices which can be instituted are not sufficient to reduce employee exposure to or below the 8-TWA PEL or STEL, the employer shall use them to reduce employee exposure to the lowest levels achievable by these controls and shall supplement them by the use of respiratory protection that complies with the requirements of subsection (7) of this section.

(c) Prohibition of rotation. The employer shall not implement a schedule of employee rotation as a means of compliance with the PELs.

(d) Leak and spill detection.

(i) The employer shall implement procedures to detect leaks of MC in the workplace. In work areas where spills may occur, the employer shall make provisions to contain any spills and to safely dispose of any MC-contaminated waste materials.

(ii) The employer shall ensure that all incidental leaks are repaired and that incidental spills are cleaned promptly by employees who use the appropriate personal protective equipment and are trained in proper methods of cleanup.

(Note to subsection (6)(d)(ii) of this section: See Appendix A of this section for examples of procedures that satisfy this requirement. Employers covered by this standard may also be subject to the hazardous waste and emergency response provisions contained in WAC 296-62-3112.)

(7) Respiratory protection.

(a) General requirements. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(i) Periods when an employee's exposure to MC exceeds or can reasonably be expected to exceed the 8-hour TWA PEL or the STEL (for example, when an employee is using MC in a regulated area);

(ii) Periods necessary to install or implement feasible engineering and work-practice controls;

(iii) In a few work operations, such as some maintenance operations and repair activities, for which the employer demonstrates that engineering and work practice controls are infeasible;

(iv) Work operations for which feasible engineering and work practice controls are not sufficient to reduce exposures to or below the PELs;

(v) Emergencies.

(b) Respirator program.

(i) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07131 (4)(b)(i) and (ii)).

(ii) Employers who provide employees with gas masks with organic-vapor canisters for the purpose of emergency

escape must replace the canisters after any emergency use and before the gas masks are returned to service.

(c) Respirator selection. The employer must select appropriate atmosphere-supplying respirators from Table 2 of this section.

Table 2.—Minimum Requirements for Respiratory Protection for Airborne Methylene Chloride

Methylene chloride airborne concentration (ppm) or condition of use	Minimum respirator required ¹
Up to 625 ppm (25 X PEL)	(1) Continuous flow supplied-air respirator, hood or helmet.
Up to 1250 ppm (50 X 8 hr TWA PEL)	(1) Full facepiece supplied-air respirator operated in negative pressure (demand) mode. (2) Full facepiece self-contained breathing apparatus (SCBA) operated in negative pressure (demand) mode.
Up to 5000 ppm (200 X 8-TWA PEL)	(1) Continuous flow supplied-air respirator, full facepiece. (2) Pressure demand supplied-air respirator, full facepiece. (3) Positive pressure full facepiece SCBA.
Unknown concentration, or above 5000 ppm (Greater than 200 X 8-TWA PEL)	(1) Positive pressure full facepiece SCBA. (2) Full facepiece pressure demand supplied-air respirator with an auxiliary self-contained air supply.
Fire fighting	Positive pressure full facepiece SCBA.
Emergency escape	(1) Any continuous flow or pressure demand SCBA. (2) Gas mask with organic vapor canister.

¹ Respirators assigned for higher airborne concentrations may be used at lower concentrations.

(d) Medical evaluation. Before having an employee use a supplied-air respirator in the negative-pressure mode, or a gas mask with an organic-vapor canister for emergency escape, the employer must:

(i) Have a physician or other licensed health care professional (PLHCP) evaluate the employee's ability to use such respiratory protection;

(ii) Ensure that the PLHCP provides their findings in a written opinion to the employee and the employer.

Note: See WAC 296-62-07150 through 296-62-07156 for medical evaluation requirements for employees using respirators.

(8) Protective work clothing and equipment.

(a) Where needed to prevent MC-induced skin or eye irritation, the employer shall provide clean protective clothing and equipment which is resistant to MC, at no cost to the employee, and shall ensure that each affected employee uses it. Eye and face protection shall meet the requirements of WAC 296-24-078, as applicable.

(b) The employer shall clean, launder, repair and replace all protective clothing and equipment required by this subsection as needed to maintain their effectiveness.

(c) The employer shall be responsible for the safe disposal of such clothing and equipment.

(Note to subsection (8)(c) of this section: See Appendix A for examples of disposal procedures that will satisfy this requirement.)

(9) Hygiene facilities.

(a) If it is reasonably foreseeable that employees' skin may contact solutions containing 0.1 percent or greater MC (for example, through splashes, spills or improper work practices), the employer shall provide conveniently located washing facilities capable of removing the MC, and shall ensure that affected employees use these facilities as needed.

(b) If it is reasonably foreseeable that an employee's eyes may contact solutions containing 0.1 percent or greater MC (for example through splashes, spills or improper work practices), the employer shall provide appropriate eyewash facilities within the immediate work area for emergency use, and shall ensure that affected employees use those facilities when necessary.

(10) Medical surveillance.

(a) Affected employees. The employer shall make medical surveillance available for employees who are or may be exposed to MC as follows:

(i) At or above the action level on 30 or more days per year, or above the 8-hour TWA PEL or the STEL on 10 or more days per year;

(ii) Above the 8-TWA PEL or STEL for any time period where an employee has been identified by a physician or other licensed health care professional as being at risk from cardiac disease or from some other serious MC-related health condition and such employee requests inclusion in the medical surveillance program;

(iii) During an emergency.

(b) Costs. The employer shall provide all required medical surveillance at no cost to affected employees, without loss of pay and at a reasonable time and place.

(c) Medical personnel. The employer shall ensure that all medical surveillance procedures are performed by a physician or other licensed health care professional, as defined in subsection (2) of this section.

(d) Frequency of medical surveillance. The employer shall make medical surveillance available to each affected employee as follows:

(i) Initial surveillance. The employer shall provide initial medical surveillance under the schedule provided by subsection (14)(b)(iii) of this section, or before the time of initial assignment of the employee, whichever is later. The employer need not provide the initial surveillance if medical records show that an affected employee has been provided with medical surveillance that complies with this section within 12 months before December 1.

(ii) Periodic medical surveillance. The employer shall update the medical and work history for each affected employee annually. The employer shall provide periodic physical examinations, including appropriate laboratory surveillance, as follows:

(A) For employees 45 years of age or older, within 12 months of the initial surveillance or any subsequent medical surveillance; and

(B) For employees younger than 45 years of age, within 36 months of the initial surveillance or any subsequent medical surveillance.

(iii) Termination of employment or reassignment. When an employee leaves the employer's workplace, or is reassigned to an area where exposure to MC is consistently at or below the action level and STEL, medical surveillance shall be made available if six months or more have elapsed since the last medical surveillance.

(iv) Additional surveillance. The employer shall provide additional medical surveillance at frequencies other than those listed above when recommended in the written medical opinion. (For example, the physician or other licensed health care professional may determine an examination is warranted in less than 36 months for employees younger than 45 years of age based upon evaluation of the results of the annual medical and work history.)

(e) Content of medical surveillance.

(i) Medical and work history. The comprehensive medical and work history shall emphasize neurological symptoms, skin conditions, history of hematologic or liver disease, signs or symptoms suggestive of heart disease (angina, coronary artery disease), risk factors for cardiac disease, MC exposures, and work practices and personal protective equipment used during such exposures.

(Note to subsection (10)(e)(i) of this section: See Appendix B of this section for an example of a medical and work history format that would satisfy this requirement.)

(ii) Physical examination. Where physical examinations are provided as required above, the physician or other licensed health care professional shall accord particular attention to the lungs, cardiovascular system (including blood pressure and pulse), liver, nervous system, and skin. The physician or other licensed health care professional shall determine the extent and nature of the physical examination based on the health status of the employee and analysis of the medical and work history.

(iii) Laboratory surveillance. The physician or other licensed health care professional shall determine the extent of any required laboratory surveillance based on the employee's observed health status and the medical and work history.

(Note to subsection (10)(e)(iii) of this section: See Appendix B of this section for information regarding medical tests. Laboratory surveillance may include before-and-after-shift carboxyhemoglobin determinations, resting ECG, hematocrit, liver function tests and cholesterol levels.)

(iv) Other information or reports. The medical surveillance shall also include any other information or reports the physician or other licensed health care professional determines are necessary to assess the employee's health in relation to MC exposure.

(f) Content of emergency medical surveillance. The employer shall ensure that medical surveillance made available when an employee has been exposed to MC in emergency situations includes, at a minimum:

(i) Appropriate emergency treatment and decontamination of the exposed employee;

(ii) Comprehensive physical examination with special emphasis on the nervous system, cardiovascular system, lungs, liver and skin, including blood pressure and pulse;

(iii) Updated medical and work history, as appropriate for the medical condition of the employee; and

(iv) Laboratory surveillance, as indicated by the employee's health status.

(Note to subsection (10)(f)(iv) of this section: See Appendix B for examples of tests which may be appropriate.)

(g) Additional examinations and referrals. Where the physician or other licensed health care professional determines it is necessary, the scope of the medical examination shall be expanded and the appropriate additional medical surveillance, such as referrals for consultation or examination, shall be provided.

(h) Information provided to the physician or other licensed health care professional. The employer shall provide the following information to a physician or other licensed health care professional who is involved in the diagnosis of MC-induced health effects:

(i) A copy of this section including its applicable appendices;

(ii) A description of the affected employee's past, current and anticipated future duties as they relate to the employee's MC exposure;

(iii) The employee's former or current exposure levels or, for employees not yet occupationally exposed to MC, the employee's anticipated exposure levels and the frequency and exposure levels anticipated to be associated with emergencies;

(iv) A description of any personal protective equipment, such as respirators, used or to be used; and

(v) Information from previous employment-related medical surveillance of the affected employee which is not otherwise available to the physician or other licensed health care professional.

(i) Written medical opinions.

(i) For each physical examination required by this section, the employer shall ensure that the physician or other licensed health care professional provides to the employer and to the affected employee a written opinion regarding the results of that examination within 15 days of completion of the evaluation of medical and laboratory findings, but not more than 30 days after the examination. The written medical opinion shall be limited to the following information:

(A) The physician's or other licensed health care professional's opinion concerning whether exposure to MC may contribute to or aggravate the employee's existing cardiac, hepatic, neurological (including stroke) or dermal disease or whether the employee has any other medical condition(s) that would place the employee's health at increased risk of material impairment from exposure to MC;

(B) Any recommended limitations upon the employee's exposure to MC, removal from MC exposure, or upon the employee's use of protective clothing or equipment and respirators;

(C) A statement that the employee has been informed by the physician or other licensed health care professional that MC is a potential occupational carcinogen, of risk factors for heart disease, and the potential for exacerbation of underlying

heart disease by exposure to MC through its metabolism to carbon monoxide; and

(D) A statement that the employee has been informed by the physician or other licensed health care professional of the results of the medical examination and any medical conditions resulting from MC exposure which require further explanation or treatment.

(ii) The employer shall instruct the physician or other licensed health care professional not to reveal to the employer, orally or in the written opinion, any specific records, findings, and diagnoses that have no bearing on occupational exposure to MC.

(Note to subsection (10)(h)(ii) of this section: The written medical opinion may also include information and opinions generated to comply with other OSHA health standards.)

(j) Medical presumption. For purposes of this subsection (10), the physician or other licensed health care professional shall presume, unless medical evidence indicates to the contrary, that a medical condition is unlikely to require medical removal from MC exposure if the employee is not exposed to MC above the 8-hour TWA PEL. If the physician or other licensed health care professional recommends removal for an employee exposed below the 8-hour TWA PEL, the physician or other licensed health care professional shall cite specific medical evidence, sufficient to rebut the presumption that exposure below the 8-hour TWA PEL is unlikely to require removal, to support the recommendation. If such evidence is cited by the physician or other licensed health care professional, the employer must remove the employee. If such evidence is not cited by the physician or other licensed health care professional, the employer is not required to remove the employee.

(k) Medical removal protection (MRP).

(i) Temporary medical removal and return of an employee.

(A) Except as provided in (j) of this subsection, when a medical determination recommends removal because the employee's exposure to MC may contribute to or aggravate the employee's existing cardiac, hepatic, neurological (including stroke), or skin disease, the employer must provide medical removal protection benefits to the employee and either:

(I) Transfer the employee to comparable work where methylene chloride exposure is below the action level; or

(II) Remove the employee from MC exposure.

(B) If comparable work is not available and the employer is able to demonstrate that removal and the costs of extending MRP benefits to an additional employee, considering feasibility in relation to the size of the employer's business and the other requirements of this standard, make further reliance on MRP an inappropriate remedy, the employer may retain the additional employee in the existing job until transfer or removal becomes appropriate, provided:

(I) The employer ensures that the employee receives additional medical surveillance, including a physical examination at least every 60 days until transfer or removal occurs; and

(II) The employer or PLHCP informs the employee of the risk to the employee's health from continued MC exposure.

(C) The employer shall maintain in effect any job-related protective measures or limitations, other than removal, for as long as a medical determination recommends them to be necessary.

(ii) End of MRP benefits and return of the employee to former job status.

(A) The employer may cease providing MRP benefits at the earliest of the following:

(I) Six months;

(II) Return of the employee to the employee's former job status following receipt of a medical determination concluding that the employee's exposure to MC no longer will aggravate any cardiac, hepatic, neurological (including stroke), or dermal disease;

(III) Receipt of a medical determination concluding that the employee can never return to MC exposure.

(B) For the purposes of this subsection (10), the requirement that an employer return an employee to the employee's former job status is not intended to expand upon or restrict any rights an employee has or would have had, absent temporary medical removal, to a specific job classification or position under the terms of a collective bargaining agreement.

(I) Medical removal protection benefits.

(i) For purposes of this subsection (10), the term medical removal protection benefits means that, for each removal, an employer must maintain for up to six months the earnings, seniority, and other employment rights and benefits of the employee as though the employee had not been removed from MC exposure or transferred to a comparable job.

(ii) During the period of time that an employee is removed from exposure to MC, the employer may condition the provision of medical removal protection benefits upon the employee's participation in follow-up medical surveillance made available pursuant to this section.

(iii) If a removed employee files a workers' compensation claim for a MC-related disability, the employer shall continue the MRP benefits required by this section until either the claim is resolved or the 6-month period for payment of MRP benefits has passed, whichever occurs first. To the extent the employee is entitled to indemnity payments for earnings lost during the period of removal, the employer's obligation to provide medical removal protection benefits to the employee shall be reduced by the amount of such indemnity payments.

(iv) The employer's obligation to provide medical removal protection benefits to a removed employee shall be reduced to the extent that the employee receives compensation for earnings lost during the period of removal from either a publicly or an employer-funded compensation program, or receives income from employment with another employer made possible by virtue of the employee's removal.

(m) Voluntary removal or restriction of an employee. Where an employer, although not required by this section to do so, removes an employee from exposure to MC or otherwise places any limitation on an employee due to the effects of MC exposure on the employee's medical condition, the employer shall provide medical removal protection benefits to the employee equal to those required by (I) of this subsection.

(n) Multiple health care professional review mechanism.

(i) If the employer selects the initial physician or licensed health care professional (PLHCP) to conduct any medical examination or consultation provided to an employee under (k) of this subsection, the employer shall notify the employee of the right to seek a second medical opinion each time the employer provides the employee with a copy of the written opinion of that PLHCP.

(ii) If the employee does not agree with the opinion of the employer-selected PLHCP, notifies the employer of that fact, and takes steps to make an appointment with a second PLHCP within 15 days of receiving a copy of the written opinion of the initial PLHCP, the employer shall pay for the PLHCP chosen by the employee to perform at least the following:

(A) Review any findings, determinations or recommendations of the initial PLHCP; and

(B) Conduct such examinations, consultations, and laboratory tests as the PLHCP deems necessary to facilitate this review.

(iii) If the findings, determinations or recommendations of the second PLHCP differ from those of the initial PLHCP, then the employer and the employee shall instruct the two health care professionals to resolve the disagreement.

(iv) If the two health care professionals are unable to resolve their disagreement within 15 days, then those two health care professionals shall jointly designate a PLHCP who is a specialist in the field at issue. The employer shall pay for the specialist to perform at least the following:

(A) Review the findings, determinations, and recommendations of the first two PLHCPs; and

(B) Conduct such examinations, consultations, laboratory tests and discussions with the prior PLHCPs as the specialist deems necessary to resolve the disagreements of the prior health care professionals.

(v) The written opinion of the specialist shall be the definitive medical determination. The employer shall act consistent with the definitive medical determination, unless the employer and employee agree that the written opinion of one of the other two PLHCPs shall be the definitive medical determination.

(vi) The employer and the employee or authorized employee representative may agree upon the use of any expeditious alternate health care professional determination mechanism in lieu of the multiple health care professional review mechanism provided by this section so long as the alternate mechanism otherwise satisfies the requirements contained in this section.

(11) Hazard communication. The employer shall communicate the following hazards associated with MC on labels and in material safety data sheets in accordance with the requirements of the hazard communication standard, WAC 296-62-054: Cancer, cardiac effects (including elevation of carboxyhemoglobin), central nervous system effects, liver effects, and skin and eye irritation.

(12) Employee information and training.

(a) The employer shall provide information and training for each affected employee prior to or at the time of initial assignment to a job involving potential exposure to MC.

(b) The employer shall ensure that information and training is presented in a manner that is understandable to the employees.

(c) In addition to the information required under the hazard communication standard at WAC 296-62-054:

(i) The employer shall inform each affected employee of the requirements of this section and information available in its appendices, as well as how to access or obtain a copy of it in the workplace;

(ii) Wherever an employee's exposure to airborne concentrations of MC exceeds or can reasonably be expected to exceed the action level, the employer shall inform each affected employee of the quantity, location, manner of use, release, and storage of MC and the specific operations in the workplace that could result in exposure to MC, particularly noting where exposures may be above the 8-hour TWA PEL or STEL;

(d) The employer shall train each affected employee as required under the hazard communication standard at WAC 296-62-054, as appropriate.

(e) The employer shall re-train each affected employee as necessary to ensure that each employee exposed above the action level or the STEL maintains the requisite understanding of the principles of safe use and handling of MC in the workplace.

(f) Whenever there are workplace changes, such as modifications of tasks or procedures or the institution of new tasks or procedures, which increase employee exposure, and where those exposures exceed or can reasonably be expected to exceed the action level, the employer shall update the training as necessary to ensure that each affected employee has the requisite proficiency.

(g) An employer whose employees are exposed to MC at a multi-employer worksite shall notify the other employers with work operations at that site in accordance with the requirements of the hazard communication standard, WAC 296-62-054, as appropriate.

(h) The employer shall provide to the director, upon request, all available materials relating to employee information and training.

(13) Recordkeeping.

(a) Objective data.

(i) Where an employer seeks to demonstrate that initial monitoring is unnecessary through reasonable reliance on objective data showing that any materials in the workplace containing MC will not release MC at levels which exceed the action level or the STEL under foreseeable conditions of exposure, the employer shall establish and maintain an accurate record of the objective data relied upon in support of the exemption.

(ii) This record shall include at least the following information:

(A) The MC-containing material in question;

(B) The source of the objective data;

(C) The testing protocol, results of testing, and/or analysis of the material for the release of MC;

(D) A description of the operation exempted under subsection (4)(b)(i) of this section and how the data support the exemption; and

(E) Other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.

(iii) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

(b) Exposure measurements.

(i) The employer shall establish and keep an accurate record of all measurements taken to monitor employee exposure to MC as prescribed in subsection (4) of this section.

(ii) Where the employer has 20 or more employees, this record shall include at least the following information:

(A) The date of measurement for each sample taken;

(B) The operation involving exposure to MC which is being monitored;

(C) Sampling and analytical methods used and evidence of their accuracy;

(D) Number, duration, and results of samples taken;

(E) Type of personal protective equipment, such as respiratory protective devices, worn, if any; and

(F) Name, Social Security number, job classification and exposure of all of the employees represented by monitoring, indicating which employees were actually monitored.

(iii) Where the employer has fewer than 20 employees, the record shall include at least the following information:

(A) The date of measurement for each sample taken;

(B) Number, duration, and results of samples taken; and

(C) Name, Social Security number, job classification and exposure of all of the employees represented by monitoring, indicating which employees were actually monitored.

(iv) The employer shall maintain this record for at least thirty (30) years, in accordance with WAC 296-62-052.

(c) Medical surveillance.

(i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance under subsection (10) of this section.

(ii) The record shall include at least the following information:

(A) The name, Social Security number and description of the duties of the employee;

(B) Written medical opinions; and

(C) Any employee medical conditions related to exposure to MC.

(iii) The employer shall ensure that this record is maintained for the duration of employment plus thirty (30) years, in accordance with WAC 296-62-052.

(d) Availability.

(i) The employer, upon written request, shall make all records required to be maintained by this section available to the director for examination and copying in accordance with WAC 296-62-052.

(Note to subsection (13)(d)(i) of this section: All records required to be maintained by this section may be kept in the most administratively convenient form (for example, electronic or computer records would satisfy this requirement).)

(ii) The employer, upon request, shall make any employee exposure and objective data records required by this section available for examination and copying by affected employees, former employees, and designated representatives in accordance with WAC 296-62-052.

(iii) The employer, upon request, shall make employee medical records required to be kept by this section available

for examination and copying by the subject employee and by anyone having the specific written consent of the subject employee in accordance with WAC 296-62-052.

(e) Transfer of records. The employer shall comply with the requirements concerning transfer of records set forth in WAC 296-62-05215.

(14) Dates.

(a) Engineering controls required under subsection (6)(a) of this section shall be implemented according to the following schedule:

(i) For employers with fewer than 20 employees, no later than April 10, 2000.

(ii) For employers with fewer than 150 employees engaged in foam fabrication; for employers with fewer than 50 employees engaged in furniture refinishing, general aviation aircraft stripping, and product formulation; for employers with fewer than 50 employees using MC-based adhesives for boat building and repair, recreational vehicle manufacture, van conversion, and upholstery; for employers with fewer than 50 employees using MC in construction work for restoration and preservation of buildings, painting and paint removal, cabinet making and/or floor refinishing and resurfacing, no later than April 10, 2000.

(iii) For employers engaged in polyurethane foam manufacturing with 20 or more employees, no later than October 10, 1999.

(b) Use of respiratory protection whenever an employee's exposure to MC exceeds or can reasonably be expected to exceed the 8-hour TWA PEL, in accordance with subsection (3)(a), (5)(c), (6)(a) and (7)(a) of this section, shall be implemented according to the following schedule:

(i) For employers with fewer than 150 employees engaged in foam fabrication; for employers with fewer than 50 employees engaged in furniture refinishing, general aviation aircraft stripping, and product formulation; for employers with fewer than 50 employees using MC-based adhesives for boat building and repair, recreational vehicle manufacture, van conversion, and upholstery; for employers with fewer than 50 employees using MC in construction work for restoration and preservation of buildings, painting and paint removal, cabinet making and/or floor refinishing and resurfacing, no later than April 10, 2000.

(ii) For employers engaged in polyurethane foam manufacturing with 20 or more employees, no later than October 10, 1999.

(c) Notification of corrective action under subsection (4)(e)(ii) of this section, no later than 90 days before the compliance date applicable to such corrective action.

(d) Transitional dates. The exposure limits for MC specified in WAC 296-62-07515 Table 1, shall remain in effect until the start-up dates for the exposure limits specified in subsection (14) of this section, or if the exposure limits in this section are stayed or vacated.

(e) Unless otherwise specified in this subsection (14), all other requirements of this section shall be complied with immediately.

(15) Appendices. The information contained in the appendices does not, by itself, create any additional obligations not otherwise imposed or detract from any existing obligation.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07470, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-18-062, § 296-62-07470, filed 9/2/97, effective 12/1/97.]

WAC 296-62-07473 Appendix A. Substance Safety Data Sheet and Technical Guidelines for Methylene Chloride

I. Substance Identification

A. Substance: Methylene chloride (CH₂Cl₂).

B. Synonyms: MC, Dichloromethane (DCM); Methylene dichloride; Methylene bichloride; Methane dichloride; CAS: 75-09-2; NCI-C50102.

C. Physical data:

1. Molecular weight: 84.9.
2. Boiling point (760 mm Hg): 39.8 deg.C (104 deg.F).
3. Specific gravity (water=1): 1.3.
4. Vapor density (air=1 at boiling point): 2.9.
5. Vapor pressure at 20 deg. C (68 deg. F): 350 mm Hg.
6. Solubility in water, g/100 g water at 20 deg. C (68 deg. F)=1.32.

7. Appearance and odor: colorless liquid with a chloroform-like odor.

D. Uses: MC is used as a solvent, especially where high volatility is required. It is a good solvent for oils, fats, waxes, resins, bitumen, rubber and cellulose acetate and is a useful paint stripper and degreaser. It is used in paint removers, in propellant mixtures for aerosol containers, as a solvent for plastics, as a degreasing agent, as an extracting agent in the pharmaceutical industry and as a blowing agent in polyurethane foams. Its solvent property is sometimes increased by mixing with methanol, petroleum naphtha or tetrachloroethylene.

E. Appearance and odor: MC is a clear colorless liquid with a chloroform-like odor. It is slightly soluble in water and completely miscible with most organic solvents.

F. Permissible exposure: Exposure may not exceed 25 parts MC per million parts of air (25 ppm) as an eight-hour time-weighted average (8-hour TWA PEL) or 125 parts of MC per million parts of air (125 ppm) averaged over a 15-minute period (STEL).

II. Health Hazard Data

A. MC can affect the body if it is inhaled or if the liquid comes in contact with the eyes or skin. It can also affect the body if it is swallowed.

B. Effects of overexposure:

1. Short-term Exposure: MC is an anesthetic. Inhaling the vapor may cause mental confusion, light-headedness, nausea, vomiting, and headache. Continued exposure may cause increased light-headedness, staggering, unconsciousness, and even death. High vapor concentrations may also cause irritation of the eyes and respiratory tract. Exposure to MC may make the symptoms of angina (chest pains) worse. Skin exposure to liquid MC may cause irritation. If liquid MC remains on the skin, it may cause skin burns. Splashes of the liquid into the eyes may cause irritation.

2. Long-term (chronic) exposure: The best evidence that MC causes cancer is from laboratory studies in which rats, mice and hamsters inhaled MC 6 hours per day, 5 days per week for 2 years. MC exposure produced lung and liver tumors in mice and mammary tumors in rats. No carcinogenic effects of MC were found in hamsters. There are also

some human epidemiological studies which show an association between occupational exposure to MC and increases in biliary (bile duct) cancer and a type of brain cancer. Other epidemiological studies have not observed a relationship between MC exposure and cancer. WISHA interprets these results to mean that there is suggestive (but not absolute) evidence that MC is a human carcinogen.

C. Reporting signs and symptoms: You should inform your employer if you develop any signs or symptoms and suspect that they are caused by exposure to MC.

D. Warning Properties:

1. Odor Threshold: Different authors have reported varying odor thresholds for MC. Kirk-Othmer and Sax both reported 25 to 50 ppm; Summer and May both reported 150 ppm; Spector reports 320 ppm. Patty, however, states that since one can become adapted to the odor, MC should not be considered to have adequate warning properties.

2. Eye Irritation Level: Kirk-Othmer reports that "MC vapor is seriously damaging to the eyes." Sax agrees with Kirk-Othmer's statement. The ACGIH Documentation of TLVs states that irritation of the eyes has been observed in workers exposed to concentrations up to 5000 ppm.

3. Evaluation of Warning Properties: Since a wide range of MC odor thresholds are reported (25-320 ppm), and human adaptation to the odor occurs, MC is considered to be a material with poor warning properties.

III. Emergency First Aid Procedures

In the event of emergency, institute first aid procedures and send for first aid or medical assistance.

A. Eye and Skin Exposures: If there is a potential for liquid MC to come in contact with eye or skin, face shields and skin protective equipment must be provided and used. If liquid MC comes in contact with the eye, get medical attention. Contact lenses should not be worn when working with this chemical.

B. Breathing: If a person breathes in large amounts of MC, move the exposed person to fresh air at once. If breathing has stopped, perform cardiopulmonary resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.

C. Rescue: Move the affected person from the hazardous exposure immediately. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises. Do not become a casualty yourself.

IV. Respirators, Protective Clothing, and Eye Protection

A. Respirators: Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not feasible, when such controls are in the process of being installed, or when these controls fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the National Institute

for Occupational Safety and Health (NIOSH). Supplied-air respirators are required because air-purifying respirators do not provide adequate respiratory protection against MC. In addition to respirator selection, a complete written respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation. If you can smell MC while wearing a respirator, proceed immediately to fresh air. If you experience difficulty in breathing while wearing a respirator, tell your employer.

B. Protective Clothing: Employees must be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with liquid MC or contact with vessels containing liquid MC. Any clothing which becomes wet with liquid MC should be removed immediately and not reworn until the employer has ensured that the protective clothing is fit for reuse. Contaminated protective clothing should be placed in a regulated area designated by the employer for removal of MC before the clothing is laundered or disposed of. Clothing and equipment should remain in the regulated area until all of the MC contamination has evaporated; clothing and equipment should then be laundered or disposed of as appropriate.

C. Eye Protection: Employees should be provided with and required to use splash-proof safety goggles where liquid MC may contact the eyes.

V. Housekeeping and Hygiene Facilities

For purposes of complying with WAC 296-24-120, the following items should be emphasized:

A. The workplace should be kept clean, orderly, and in a sanitary condition. The employer should institute a leak and spill detection program for operations involving liquid MC in order to detect sources of fugitive MC emissions.

B. Emergency drench showers and eyewash facilities are recommended. These should be maintained in a sanitary condition. Suitable cleansing agents should also be provided to assure the effective removal of MC from the skin.

C. Because of the hazardous nature of MC, contaminated protective clothing should be placed in a regulated area designated by the employer for removal of MC before the clothing is laundered or disposed of.

VI. Precautions for Safe Use, Handling, and Storage

A. Fire and Explosion Hazards: MC has no flash point in a conventional closed tester, but it forms flammable vapor-air mixtures at approximately 100 deg. C (212 deg. F), or higher. It has a lower explosion limit of 12%, and an upper explosion limit of 19% in air. It has an autoignition temperature of 556.1 deg. C (1033 deg. F), and a boiling point of 39.8 deg. C (104 deg. F). It is heavier than water with a specific gravity of 1.3. It is slightly soluble in water.

B. Reactivity Hazards: Conditions contributing to the instability of MC are heat and moisture. Contact with strong oxidizers, caustics, and chemically active metals such as aluminum or magnesium powder, sodium and potassium may cause fires and explosions. Special precautions: Liquid MC will attack some forms of plastics, rubber, and coatings.

C. Toxicity: Liquid MC is painful and irritating if splashed in the eyes or if confined on the skin by gloves, clothing, or shoes. Vapors in high concentrations may cause

narcosis and death. Prolonged exposure to vapors may cause cancer or exacerbate cardiac disease.

D. Storage: Protect against physical damage. Because of its corrosive properties, and its high vapor pressure, MC should be stored in plain, galvanized or lead lined, mild steel containers in a cool, dry, well ventilated area away from direct sunlight, heat source and acute fire hazards.

E. Piping Material: All piping and valves at the loading or unloading station should be of material that is resistant to MC and should be carefully inspected prior to connection to the transport vehicle and periodically during the operation.

F. Usual Shipping Containers: Glass bottles, 5- and 55-gallon steel drums, tank cars, and tank trucks.

Note: This section addresses MC exposure in marine terminal and longshore employment only where leaking or broken packages allow MC exposure that is not addressed through compliance with WAC 296-56.

G. Electrical Equipment: Electrical installations in Class I hazardous locations as defined in Article 500 of the National Electrical Code, should be installed according to Article 501 of the code; and electrical equipment should be suitable for use in atmospheres containing MC vapors. See Flammable and Combustible Liquids Code (NFPA No. 325M), Chemical Safety Data Sheet SD-86 (Manufacturing Chemists' Association, Inc.).

H. Fire Fighting: When involved in fire, MC emits highly toxic and irritating fumes such as phosgene, hydrogen chloride and carbon monoxide. Wear breathing apparatus and use water spray to keep fire-exposed containers cool. Water spray may be used to flush spills away from exposures. Extinguishing media are dry chemical, carbon dioxide, foam. For purposes of compliance with WAC 296-24-956, locations classified as hazardous due to the presence of MC shall be Class I.

I. Spills and Leaks: Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed. If MC has spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
2. Ventilate area of spill or leak.
3. Collect for reclamation or absorb in vermiculite, dry sand, earth, or a similar material.

J. Methods of Waste Disposal: Small spills should be absorbed onto sand and taken to a safe area for atmospheric evaporation. Incineration is the preferred method for disposal of large quantities by mixing with a combustible solvent and spraying into an incinerator equipped with acid scrubbers to remove hydrogen chloride gases formed. Complete combustion will convert carbon monoxide to carbon dioxide. Care should be taken for the presence of phosgene.

K. You should not keep food, beverage, or smoking materials, or eat or smoke in regulated areas where MC concentrations are above the permissible exposure limits.

L. Portable heating units should not be used in confined areas where MC is used.

M. Ask your supervisor where MC is used in your work area and for any additional plant safety and health rules.

VII. Medical Requirements

Your employer is required to offer you the opportunity to participate in a medical surveillance program if you are

exposed to MC at concentrations at or above the action level (12.5 ppm 8-hour TWA) for more than 30 days a year or at concentrations exceeding the PELs (25 ppm 8-hour TWA or 125 ppm 15-minute STEL) for more than 10 days a year. If you are exposed to MC at concentrations over either of the PELs, your employer will also be required to have a physician or other licensed health care professional ensure that you are able to wear the respirator that you are assigned. Your employer must provide all medical examinations relating to your MC exposure at a reasonable time and place and at no cost to you.

VIII. Monitoring and Measurement Procedures

A. Exposure above the Permissible Exposure Limit:

1. Eight-hour exposure evaluation: Measurements taken for the purpose of determining employee exposure under this section are best taken with consecutive samples covering the full shift. Air samples must be taken in the employee's breathing zone.

2. Monitoring techniques: The sampling and analysis under this section may be performed by collection of the MC vapor on two charcoal adsorption tubes in series or other composition adsorption tubes, with subsequent chemical analysis. Sampling and analysis may also be performed by instruments such as real-time continuous monitoring systems, portable direct reading instruments, or passive dosimeters as long as measurements taken using these methods accurately evaluate the concentration of MC in employees' breathing zones. OSHA method 80 is an example of a validated method of sampling and analysis of MC. Copies of this method are available from OSHA or can be downloaded from the Internet at <http://www.osha.gov>. The employer has the obligation of selecting a monitoring method which meets the accuracy and precision requirements of the standard under his or her unique field conditions. The standard requires that the method of monitoring must be accurate, to a 95 percent confidence level, to plus or minus 25 percent for concentrations of MC at or above 25 ppm, and to plus or minus 35 percent for concentrations at or below 25 ppm. In addition to OSHA method 80, there are numerous other methods available for monitoring for MC in the workplace.

B. Since many of the duties relating to employee exposure are dependent on the results of measurement procedures, employers must assure that the evaluation of employee exposure is performed by a technically qualified person.

IX. Observation of Monitoring

Your employer is required to perform measurements that are representative of your exposure to MC and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear, protective clothing and equipment.

Access To Information

A. Your employer is required to inform you of the information contained in this Appendix. In addition, your employer must instruct you in the proper work practices for using MC, emergency procedures, and the correct use of protective equipment.

B. Your employer is required to determine whether you are being exposed to MC. You or your representative has the right to observe employee measurements and to record the results obtained. Your employer is required to inform you of your exposure. If your employer determines that you are being over exposed, he or she is required to inform you of the actions which are being taken to reduce your exposure to within permissible exposure limits.

C. Your employer is required to keep records of your exposures and medical examinations. These records must be kept by the employer for at least thirty (30) years.

D. Your employer is required to release your exposure and medical records to you or your representative upon your request.

E. Your employer is required to provide labels and material safety data sheets (MSDS) for all materials, mixtures or solutions composed of greater than 0.1 percent MC. An example of a label that would satisfy these requirements would be:

**Danger Contains Methylene Chloride
Potential Cancer Hazard**

May worsen heart disease because methylene chloride is converted to carbon monoxide in the body.

May cause dizziness, headache, irritation of the throat and lungs, loss of consciousness and death at high concentrations (for example, if used in a poorly ventilated room).

Avoid Skin Contact. Contact with liquid causes skin and eye irritation.

X. Common Operations and Controls

The following list includes some common operations in which exposure to MC may occur and control methods which may be effective in each case:

Operations	Controls
Use as solvent in paint and varnish removers cold cleaning and ultrasonic cleaning, and as a solvent in furniture stripping.	General dilution ventilation; local; manufacture of aerosols; cold cleaning exhaust ventilation; personal protective equipment; substitution.
Use as solvent in vapor degreasing.	Process enclosure; local exhaust ventilation; chilling coils; substitution.
Use as a secondary refrigerant in air scientific testing.	General dilution ventilation; local conditioning and exhaust ventilation; personal protective equipment.

[Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-18-062, § 296-62-07473, filed 9/2/97, effective 12/1/97.]

WAC 296-62-07475 Appendix B. Medical Surveillance for Methylene Chloride

I. Primary Route of Entry Inhalation.

II. Toxicology.

Methylene Chloride (MC) is primarily an inhalation hazard. The principal acute hazardous effects are the depressant action on the central nervous system, possible cardiac toxicity and possible liver toxicity. The range of CNS effects are from decreased eye/hand coordination and decreased performance in vigilance tasks to narcosis and even death of individuals exposed at very high doses. Cardiac toxicity is due to the metabolism of MC to carbon monoxide, and the effects of carbon monoxide on heart tissue. Carbon monoxide displaces oxygen in the blood, decreases the oxygen available to heart tissue, increasing the risk of damage to the heart, which may result in heart attacks in susceptible individuals. Susceptible individuals include persons with heart disease and those with risk factors for heart disease. Elevated liver enzymes and irritation to the respiratory passages and eyes have also been reported for both humans and experimental animals exposed to MC vapors.

MC is metabolized to carbon monoxide and carbon dioxide via two separate pathways. Through the first pathway, MC is metabolized to carbon monoxide as an end-product via the P-450 mixed function oxidase pathway located in the microsomal fraction of the cell. This biotransformation of MC to carbon monoxide occurs through the process of microsomal oxidative dechlorination which takes place primarily in the liver. The amount of conversion to carbon monoxide is significant as measured by the concentration of carboxyhemoglobin, up to 12% measured in the blood following occupational exposure of up to 610 ppm. Through the second pathway, MC is metabolized to carbon dioxide as an end product (with formaldehyde and formic acid as metabolic intermediates) via the glutathione dependent enzyme found in the cytosolic fraction of the liver cell. Metabolites along this pathway are believed to be associated with the carcinogenic activity of MC.

MC has been tested for carcinogenicity in several laboratory rodents. These rodent studies indicate that there is clear evidence that MC is carcinogenic to male and female mice and female rats. Based on epidemiologic studies, OSHA has concluded that there is suggestive evidence of increased cancer risk in MC-related worker populations. The epidemiological evidence is consistent with the finding of excess cancer in the experimental animal studies. NIOSH regards MC as a potential occupational carcinogen and the International Agency for Research Cancer (IARC) classifies MC as an animal carcinogen. OSHA considers MC as a suspected human carcinogen.

III. Medical Signs and Symptoms of Acute Exposure
Skin exposure to liquid MC may cause irritation or skin burns. Liquid MC can also be irritating to the eyes. MC is also absorbed through the skin and may contribute to the MC exposure by inhalation. At high concentrations in air, MC may cause nausea, vomiting, light-headedness, numbness of the extremities, changes in blood enzyme levels, and breath-

ing problems, leading to bronchitis and pulmonary edema, unconsciousness and even death.

At lower concentrations in air, MC may cause irritation to the skin, eye, and respiratory tract and occasionally headache and nausea. Perhaps the greatest problem from exposure to low concentrations of MC is the CNS effects on coordination and alertness that may cause unsafe operations of machinery and equipment, leading to self-injury or accidents. Low levels and short duration exposures do not seem to produce permanent disability, but chronic exposures to MC have been demonstrated to produce liver toxicity in animals, and therefore, the evidence is suggestive for liver toxicity in humans after chronic exposure. Chronic exposure to MC may also cause cancer.

IV. Surveillance and Preventive Considerations

As discussed above, MC is classified as a suspect or potential human carcinogen. It is a central nervous system (CNS) depressant and a skin, eye and respiratory tract irritant. At extremely high concentrations, MC has caused liver damage in animals. MC principally affects the CNS, where it acts as a narcotic. The observation of the symptoms characteristic of CNS depression, along with a physical examination, provides the best detection of early neurological disorders. Since exposure to MC also increases the carboxyhemoglobin level in the blood, ambient carbon monoxide levels would have an additive effect on that carboxyhemoglobin level. Based on such information, a periodic post-shift carboxyhemoglobin test as an index of the presence of carbon monoxide in the blood is recommended, but not required, for medical surveillance.

Based on the animal evidence and three epidemiologic studies previously mentioned, OSHA concludes that MC is a suspect human carcinogen. The medical surveillance program is designed to observe exposed workers on a regular basis. While the medical surveillance program cannot detect MC-induced cancer at a preneoplastic stage, OSHA anticipates that, as in the past, early detection and treatments of cancers leading to enhanced survival rates will continue to evolve.

A. Medical and Occupational History:

The medical and occupational work history plays an important role in the initial evaluation of workers exposed to MC. It is therefore extremely important for the examining physician or other licensed health care professional to evaluate the MC-exposed worker carefully and completely and to focus the examination on MC's potentially associated health hazards. The medical evaluation must include an annual detailed work and medical history with special emphasis on cardiac history and neurological symptoms.

An important goal of the medical history is to elicit information from the worker regarding potential signs or symptoms associated with increased levels of carboxyhemoglobin due to the presence of carbon monoxide in the blood. Physicians or other licensed health care professionals should ensure that the smoking history of all MC exposed employees is known. Exposure to MC may cause a significant increase in carboxyhemoglobin level in all exposed persons. However, smokers as well as workers with anemia or heart disease and those concurrently exposed to carbon monoxide are at especially high risk of toxic effects because of an already reduced oxygen carrying capacity of the blood.

A comprehensive or interim medical and work history should also include occurrence of headache, dizziness, fatigue, chest pain, shortness of breath, pain in the limbs, and irritation of the skin and eyes. In addition, it is important for the physician or other licensed health care professional to become familiar with the operating conditions in which exposure to MC is likely to occur. The physician or other licensed health care professional also must become familiar with the signs and symptoms that may indicate that a worker is receiving otherwise unrecognized and exceptionally high exposure levels of MC.

An example of a medical and work history that would satisfy the requirement for a comprehensive or interim work history is represented by the following:

The following is a list of recommended questions and issues for the self-administered questionnaire for methylene chloride exposure.

Questionnaire For Methylene Chloride Exposure

I. Demographic Information

1. Name _____
2. Social Security Number _____
3. Date _____
4. Date of Birth _____
5. Age _____
6. Present occupation _____
7. Sex _____
8. Race _____

II. Occupational History

1. Have you ever worked with methylene chloride, dichloromethane, methylene dichloride, or CH₂Cl₂ (all are different names for the same chemical)? Please list which on the occupational history form if you have not already.

2. If you have worked in any of the following industries and have not listed them on the occupational history form, please do so.

- Furniture stripping _____
- Polyurethane foam manufacturing _____
- Chemical manufacturing or formulation _____
- Pharmaceutical manufacturing _____

Any industry in which you used solvents to clean and degrease equipment or parts _____

- Construction, especially painting and refinishing _____
- Aerosol manufacturing _____

Any industry in which you used aerosol adhesives _____

3. If you have not listed hobbies or household projects on the occupational history form, especially furniture refinishing, spray painting, or paint stripping, please do so.

III. Medical History

A. General

1. Do you consider yourself to be in good health? If no, state reason(s).

2. Do you or have you ever had:
 - a. Persistent thirst
 - b. Frequent urination (three times or more at night)
 - c. Dermatitis or irritated skin
 - d. Nonhealing wounds

3. What prescription or nonprescription medications do you take, and for what reasons?

4. Are you allergic to any medications, and what type of reaction do you have?

B. Respiratory

1. Do you have or have you ever had any chest illnesses or diseases? Explain.

2. Do you have or have you ever had any of the following:

- a. Asthma
- b. Wheezing
- c. Shortness of breath

3. Have you ever had an abnormal chest X-ray? If so, when, where, and what were the findings?

4. Have you ever had difficulty using a respirator or breathing apparatus? Explain.

5. Do any chest or lung diseases run in your family? Explain.

6. Have you ever smoked cigarettes, cigars, or a pipe? Age started:

7. Do you now smoke?

8. If you have stopped smoking completely, how old were you when you stopped?

9. On the average of the entire time you smoked, how many packs of cigarettes, cigars, or bowls of tobacco did you smoke per day?

C. Cardiovascular

1. Have you ever been diagnosed with any of the following:

Which of the following apply to you now or did apply to you at some time in the past, even if the problem is controlled by medication? Please explain any yes answers (i.e., when problem was diagnosed, length of time on medication).

- a. High cholesterol or triglyceride level
- b. Hypertension (high blood pressure)
- c. Diabetes
- d. Family history of heart attack, stroke, or blocked arteries

2. Have you ever had chest pain? If so, answer the next five questions.

a. What was the quality of the pain (i.e., crushing, stabbing, squeezing)?

b. Did the pain go anywhere (i.e., into jaw, left arm)?

c. What brought the pain out?

d. How long did it last?

e. What made the pain go away?

3. Have you ever had heart disease, a heart attack, stroke, aneurysm, or blocked arteries anywhere in your body? Explain (when, treatment).

4. Have you ever had bypass surgery for blocked arteries in your heart or anywhere else? Explain.

5. Have you ever had any other procedures done to open up a blocked artery (balloon angioplasty, carotid endarterectomy, clot-dissolving drug)?

6. Do you have or have you ever had (explain each):

- a. Heart murmur
- b. Irregular heartbeat
- c. Shortness of breath while lying flat
- d. Congestive heart failure
- e. Ankle swelling
- f. Recurrent pain anywhere below the waist while walking

7. Have you ever had an electrocardiogram (EKG)? When?

8. Have you ever had an abnormal EKG? If so, when, where, and what were the findings?

9. Do any heart diseases, high blood pressure, diabetes, high cholesterol, or high triglycerides run in your family? Explain.

D. Hepatobiliary and Pancreas

1. Do you now or have you ever drunk alcoholic beverages? Age started: _____ Age stopped: _____.

2. Average numbers per week:

a. Beers: _____, ounces in usual container: b. Glasses of wine: _____, ounces per glass: c. Drinks: _____, ounces in usual container:

3. Do you have or have you ever had (explain each):

a. Hepatitis (infectious, autoimmune, drug-induced, or chemical)

b. Jaundice

c. Elevated liver enzymes or elevated bilirubin

d. Liver disease or cancer

E. Central Nervous System

1. Do you or have you ever had (explain each):

a. Headache

b. Dizziness

c. Fainting

d. Loss of consciousness

e. Garbled speech

f. Lack of balance

g. Mental/psychiatric illness

h. Forgetfulness

F. Hematologic

1. Do you have, or have you ever had (explain each):

a. Anemia

b. Sickle cell disease or trait

c. Glucose-6-phosphate dehydrogenase deficiency

d. Bleeding tendency disorder

2. If not already mentioned previously, have you ever had a reaction to sulfa drugs or to drugs used to prevent or treat malaria? What was the drug? Describe the reaction.

B. Physical Examination

The complete physical examination, when coupled with the medical and occupational history, assists the physician or other licensed health care professional in detecting pre-existing conditions that might place the employee at increased risk, and establishes a baseline for future health monitoring. These examinations should include:

1. Clinical impressions of the nervous system, cardiovascular function and pulmonary function, with additional tests conducted where indicated or determined by the examining physician or other licensed health care professional to be necessary.

2. An evaluation of the advisability of the worker using a respirator, because the use of certain respirators places an additional burden on the cardiopulmonary system. It is necessary for the attending physician or other licensed health care professional to evaluate the cardiopulmonary function of these workers, in order to inform the employer in a written medical opinion of the worker's ability or fitness to work in an area requiring the use of certain types of respiratory protective equipment. The presence of facial hair or scars that

might interfere with the worker's ability to wear certain types of respirators should also be noted during the examination and in the written medical opinion.

Because of the importance of lung function to workers required to wear certain types of respirators to protect themselves from MC exposure, these workers must receive an assessment of pulmonary function before they begin to wear a negative pressure respirator and at least annually thereafter. The recommended pulmonary function tests include measurement of the employee's forced vital capacity (FVC), forced expiratory volume at one second (FEV1), as well as calculation of the ratios of FEV1 to FVC, and the ratios of measured FVC and measured FEV1 to expected respective values corrected for variation due to age, sex, race, and height. Pulmonary function evaluation must be conducted by a physician or other licensed health care professional experienced in pulmonary function tests.

The following is a summary of the elements of a physical exam which would fulfill the requirements under the MC standard:

Physical Exam

I. Skin and appendages

1. Irritated or broken skin 2. Jaundice 3. Clubbing cyanosis, edema 4. Capillary refill time 5. Pallor

II. Head

1. Facial deformities 2. Scars 3. Hair growth

III. Eyes

1. Scleral icterus 2. Corneal arcus 3. Pupillary size and response 4. Fundoscopic exam

IV. Chest

1. Standard exam

V. Heart

1. Standard exam 2. Jugular vein distension 3. Peripheral pulses

VI. Abdomen

1. Liver span

VII. Nervous System

1. Complete standard neurologic exam

VIII. Laboratory

1. Hemoglobin and hematocrit 2. Alanine aminotransferase (ALT, SGPT) 3. Post-shift carboxyhemoglobin

I. Studies

1. Pulmonary function testing

2. Electrocardiogram

An evaluation of the oxygen carrying capacity of the blood of employees (for example by measured red blood cell volume) is considered useful, especially for workers acutely exposed to MC. It is also recommended, but not required, that end of shift carboxyhemoglobin levels be determined periodically, and any level above 3% for nonsmokers and above 10% for smokers should prompt an investigation of the worker and his workplace. This test is recommended because MC is metabolized to CO, which combines strongly with hemoglobin, resulting in a reduced capacity of the blood to transport oxygen in the body. This is of particular concern for cigarette smokers because they already have a diminished hemoglobin capacity due to the presence of CO in cigarette smoke.

C. Additional Examinations and Referrals

1. Examination by a Specialist

When a worker examination reveals unexplained symptoms or signs (i.e. in the physical examination or in the laboratory tests), follow-up medical examinations are necessary to assure that MC exposure is not adversely affecting the worker's health. When the examining physician or other licensed health care professional finds it necessary, additional tests should be included to determine the nature of the medical problem and the underlying cause. Where relevant, the worker should be sent to a specialist for further testing and treatment as deemed necessary. The final rule requires additional investigations to be covered and it also permits physicians or other licensed health care professionals to add appropriate or necessary tests to improve the diagnosis of disease should such tests become available in the future.

2. Emergencies

The examination of workers exposed to MC in an emergency should be directed at the organ systems most likely to be affected. If the worker has received a severe acute exposure, hospitalization may be required to assure proper medical intervention. It is not possible to precisely define "severe," but the physician or other licensed health care professional's judgment should not merely rest on hospitalization. If the worker has suffered significant conjunctival, oral, or nasal irritation, respiratory distress, or discomfort, the physician or other licensed health care professional should instigate appropriate follow-up procedures. These include attention to the eyes, lungs and the neurological system. The frequency of follow-up examinations should be determined by the attending physician or other licensed health care professional. This testing permits the early identification essential to proper medical management of such workers.

D. Employer Obligations

The employer is required to provide the responsible physician or other licensed health care professional and any specialists involved in a diagnosis with the following information: a copy of the MC standard including relevant appendices, a description of the affected employee's duties as they relate to his or her exposure to MC; an estimate of the employee's exposure including duration (e.g., 15hr/wk, three 8-hour shifts/wk, full time); a description of any personal protective equipment used by the employee, including respirators; and the results of any previous medical determinations for the affected employee related to MC exposure to the extent that this information is within the employer's control.

E. Physicians' or Other Licensed Health Care Professionals' Obligations

The standard requires the employer to ensure that the physician or other licensed health care professional provides a written statement to the employee and the employer. This statement should contain the physician's or licensed health care professional's opinion as to whether the employee has any medical condition placing him or her at increased risk of impaired health from exposure to MC or use of respirators, as appropriate. The physician or other licensed health care professional should also state his or her opinion regarding any restrictions that should be placed on the employee's exposure to MC or upon the use of protective clothing or equipment such as respirators. If the employee wears a respirator as a result of his or her exposure to MC, the physician or other licensed health care professional's opinion should also con-

tain a statement regarding the suitability of the employee to wear the type of respirator assigned.

Furthermore, the employee should be informed by the physician or other licensed health care professional about the cancer risk of MC and about risk factors for heart disease, and the potential for exacerbation of underlying heart disease by exposure to MC through its metabolism to carbon monoxide. Finally, the physician or other licensed health care professional should inform the employer that the employee has been told the results of the medical examination and of any medical conditions which require further explanation or treatment. This written opinion must not contain any information on specific findings or diagnosis unrelated to employee's occupational exposures.

The purpose in requiring the examining physician or other licensed health care professional to supply the employer with a written opinion is to provide the employer with a medical basis to assist the employer in placing employees initially, in assuring that their health is not being impaired by exposure to MC, and to assess the employee's ability to use any required protective equipment.

[Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-18-062, § 296-62-07475, filed 9/2/97, effective 12/1/97.]

WAC 296-62-07477 Appendix C.

Questions and Answers

Methylene Chloride Control in Furniture Stripping (Adapted from NIOSH publication No. 93-133)

Introduction

This appendix answers commonly asked questions about the hazards from exposure to methylene chloride. It also describes approaches to controlling methylene chloride exposure during the most common furniture stripping processes. Although these approaches were developed and field tested by the National Institute of Occupational Safety and Health, each setting requires custom installation because of the different air flow interferences at each site.

1. What is the Stripping Solution Base?

The most common active ingredient in paint removers is a chemical called methylene chloride. Methylene chloride is present in the paint remover to penetrate, blister, and finally lift the old finish. Other chemicals in paint removers work to accelerate the stripping process, to retard evaporation, and to act as thickening agents. These other ingredients may include: methanol, toluene, acetone, or paraffin.¹

2. Is Methylene Chloride Bad for Me?

Exposure to methylene chloride may cause short-term health effects or long-term health effects.

Short-Term (Acute) Health Effects

Exposure to high levels of paint removers over short periods of time can cause irritation to the skin, eyes, mucous membranes, and respiratory tracts. Other symptoms of high exposure are dizziness, headache, and lack of coordination. The occurrence of any of these symptoms indicates that you are being exposed to high levels of methylene chloride. At the onset of any of these symptoms, you should leave the work

area, get some fresh air, and determine why the levels were high.

A portion of inhaled methylene chloride is converted by the body to carbon monoxide, which can lower the blood's ability to carry oxygen. When the solvent is used properly, however, the levels of carbon monoxide should not be hazardous. Individuals with cardiovascular or pulmonary health problems should check with their physician before using the paint stripper. Individuals experiencing severe symptoms such as shortness of breath or chest pains should obtain proper medical care immediately.¹

Long-Term (Chronic) Health Effects

Methylene chloride has been shown to cause cancer in certain laboratory animal tests. The available human studies do not provide the necessary information to determine whether methylene chloride causes cancer in humans. However, as a result of the animal studies, methylene chloride is considered a potential occupational carcinogen. There is also considerable indirect evidence to suggest that workers exposed to methylene chloride may be at an increased risk of developing ischemic heart disease. Therefore, it is prudent to minimize exposure to solvent vapors.³

3. What does the Methylene Chloride Standard Require?

On January 10, 1997, the Occupational Safety and Health Administration published a new regulation for methylene chloride. The standard establishes an eight-hour time-weighted average exposure limit of 25 parts per million (ppm), as well as a short-term exposure limit of 125 ppm determined from a 15 minute sampling period. That is a reduction from the current WISHA limit of 100 ppm. The standard also sets a 12.5 ppm action level (a level that would trigger periodic exposure monitoring and medical surveillance provisions).² WISHA adopted an identical standard on [date].

The National Institute for Occupational Safety and Health recommends that methylene chloride be regarded as a "potential occupational carcinogen." NIOSH further recommends that occupational exposure to methylene chloride be controlled to the lowest feasible limit. This recommendation was based on the observation of cancers and tumors in both rats and mice exposed to methylene chloride in air.⁵

4. How Can I Be Exposed to Methylene Chloride while Stripping Furniture?

Methylene chloride can be inhaled when vapors are in the air. Inhalation of the methylene chloride vapors is generally the most important source of exposure. Methylene chloride evaporates quicker than most chemicals. The odor threshold of methylene chloride is 300 ppm.⁶ Therefore, once you smell methylene chloride, you are being over-exposed. Pouring, moving, or stirring the chemical will increase the rate of evaporation.

Methylene chloride can be absorbed through the skin either by directly touching the chemical or through your gloves. Methylene chloride can be swallowed if it gets on your hands, clothes, or beard, or if food or drinks become contaminated.

5. How Can Breathing Exposures be Reduced?

Install a Local Exhaust Ventilation System

Local exhaust ventilation can be used to control exposures. Local exhaust ventilation systems capture contaminated air from the source before it spreads into the workers' breathing zone.⁷ If engineering controls are not effective, only a self-contained breathing apparatus equipped with a full face piece and operated in a positive-pressure mode or a supplied-air respirator affords the level of protection. Air-purifying respirators such as gas masks with organic vapor canisters can only be used for escape situations.⁸ These gas masks are not suitable for normal work situations because methylene chloride is poorly absorbed by the canister filtering material.

A local exhaust system consists of the following: a hood, a fan, ductwork, and a replacement air system.^{9,10,11} Two processes are commonly used in furniture stripping: flow-over and dip tanks. For flow-over systems there are two common local exhaust controls for methylene chloride - a slot hood and a down draft hood. A slot hood of different design is most often used for dip tanks. (See Figures 1, 2, and 3.)

The hood is made of sheet metal and connected to the tank. All designs require a centrifugal fan to exhaust the fumes, ductwork connecting the hood and the fan, and a replacement air system to bring conditioned air into the building to replace the air exhausted.

In constructing or designing a slot or down draft hood, use the following data:

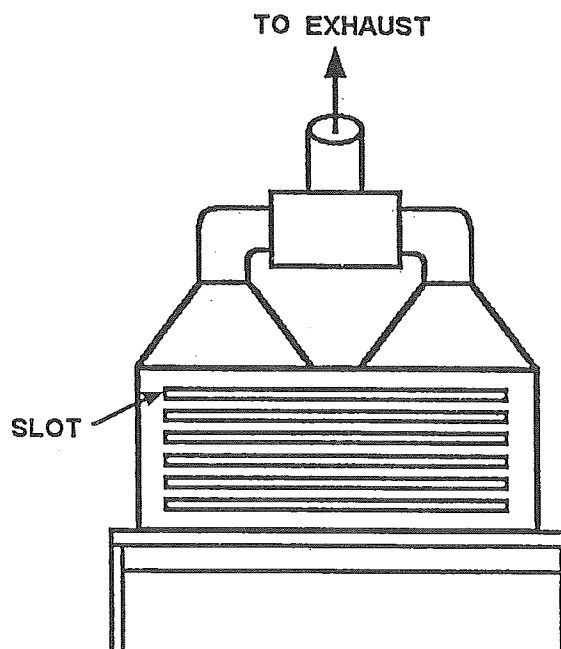


FIGURE 1 -- SLOT HOOD

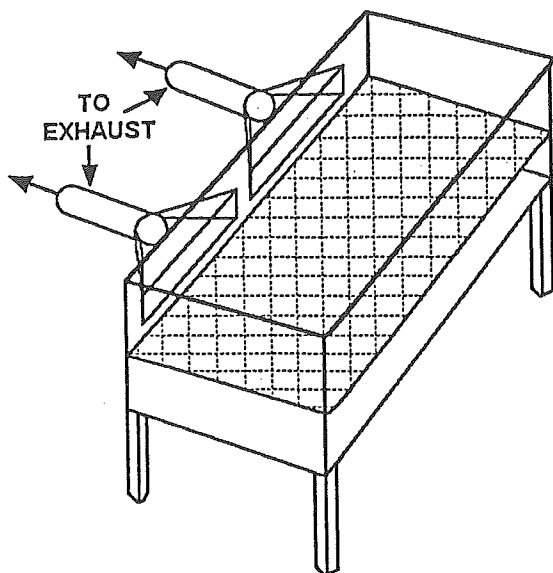


FIGURE 2 -- DOWNDRAFT HOOD

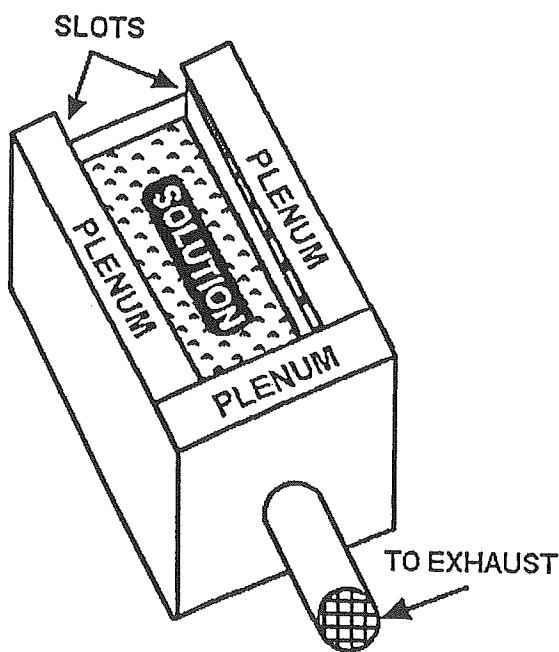


FIGURE 3 -- SLOT HOOD FOR DIP TANK

Safe Work Practices

Workers can lower exposures by decreasing their access to the methylene chloride.¹²

- 1) Turn on dip tank control system several minutes before entering the stripping area.
- 2) Avoid unnecessary transferring or moving of the stripping solution.
- 3) Keep face out of the air stream between the solution-covered furniture and the exhaust system.
- 4) Keep face out of vapor zone above the stripping solution and the dip tank.

(2001 Ed.)

- 5) Retrieve dropped items with a long handled tool.
- 6) Keep the solution-recycling system off when not in use. Cover reservoir for recycling system.
- 7) Cover dip tank when not in use.
- 8) Provide adequate ventilation for rinse area.

How Can Skin Exposures Be Reduced?

Skin exposures can be reduced by wearing gloves whenever you are in contact with the stripping solution.¹³

- 1) Two gloves should be worn. The inner glove should be made from polyethylene/ethylene vinyl alcohol (e.g., Silver Shield®, or 4H®). This material, however, does not provide good physical resistance against tears, so an outer glove made from nitrile or neoprene should be worn.
- 2) Shoulder-length gloves will be more protective.
- 3) Change gloves before the break-through time occurs. Rotate several pairs of gloves throughout the day. Let the gloves dry in a warm well ventilated area at least over night before reuse.
- 4) Keep gloves clean by rinsing often. Keep gloves in good condition. Inspect the gloves before use for pin-holes, cracks, thin spots, and stiffer than normal or sticky surfaces.
- 5) Wear a face shield or goggles to protect face and eyes.

6. What Other Problems Can Occur?

Stripping Solution Temperature

Most manufacturers of stripping solution recommend controlling the solution to a temperature of 70°F. This temperature is required for the wax in the solution to form a vapor barrier on top of the solution to keep the solution from evaporating too quickly. If the temperature is too high, the wax will not form the vapor barrier. If it is too cold, the wax will solidify and separate from the solvent causing increased evaporation. Use a belt heater to heat the solution to the correct temperature. Call your solution manufacturer for the correct temperature for your solution.¹⁴

Make-Up Air

Air will enter a building in an amount to equal the amount of air exhausted whether or not provision is made for this replacement. If a local exhaust system is added a make-up or replacement air system must be added to replace the air removed. Without a replacement air system, air will enter the building through cracks causing uncontrollable eddy currents. If the building perimeter is tightly sealed, it will prevent the air from entering and severely decrease the amount exhausted from the ventilation system. This will cause the building to be under negative pressure and decrease the performance of the exhaust system.¹⁵

Dilution Ventilation

With general or dilution ventilation, uncontaminated air is moved through the workroom by means of fans or open windows, which dilutes the pollutants in the air. Dilution ventilation does not provide effective protection to other workers and does not confine the methylene chloride vapors to one area.¹⁶

Phosgene Poisoning from Use of Kerosene Heaters

Do not use kerosene heaters or other open flame heaters while stripping furniture. Use of kerosene heaters in connection with methylene chloride can create lethal or dangerous concentrations of phosgene. Methylene chloride vapor is mixed with the air used for the combustion of kerosene in kerosene stoves. The vapor thus passes through the flames, coming into close contact with carbon monoxide at high temperatures. Any chlorine formed by decomposition may, under these conditions, react with carbon monoxide and form phosgene.¹⁷

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[Statutory Authority: RCW 49.17.040, [49.17].050, [49.17].060. 98-10-029, § 296-62-07477, filed 4/24/98, effective 7/24/98; 97-18-062, § 296-62-07477, filed 9/2/97, effective 12/1/97.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

PART H—AIR CONTAMINANTS

WAC 296-62-075 Air contaminants. (1) An employee's exposure to any substance listed in Table 1 of WAC 296-62-07515 shall be limited in accordance with the requirements of WAC 296-62-07501 through 296-62-07513.

(2) The following definitions are applicable to the limits in Table 1.

(a) Time weighted average (TWA) is the employee's average airborne exposure to any 8-hour work shift of a 40-hour work week which shall not be exceeded.

(b) Short term exposure limit (STEL) is the employee's 15-minute time weighted average exposure which shall not be exceeded at any time during a work day unless another time limit is specified in a parenthetical notation below the limit. If another time period is specified, the time weighted average exposure over that time period shall not be exceeded at any time during the working day.

(c) Ceiling is the employee's exposure which shall not be exceeded during any part of the work day. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time over a working day.

(d) The terms "substance," "air contaminant," and "material" are equivalent in meaning for WAC 296-62-075 through 296-62-07515.

[Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-19-014, § 296-62-075, filed 9/5/97, effective 11/5/97. Statutory Authority: Chapter 49.17 RCW. 89-15-002 (Order 89-06), § 296-62-075, filed 7/6/89, effective 8/7/89; Order 73-3, § 296-62-075, filed 5/7/73.]

WAC 296-62-07501 Airborne contaminants. (1) Permissible exposure limits (PELs) refer to airborne concentrations of substances without regard to the use of respiratory protection and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after

day without adverse effect. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the permissible limit, a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness.

(2) Permissible exposure limits refer to time-weighted concentrations for an 8-hour workday within a 40-hour workweek which shall not be exceeded.

(a) The cumulative time-weighted average exposure for an 8-hour work shift shall be computed as follows:

$$E = \frac{C_a T_a + C_b T_b + \dots + C_n T_n}{8}$$

where:

E is the equivalent exposure for the working shift.

C is the concentration during any period of time T where the concentration remains constant.

T is the duration in hours of the exposure at the concentration C.

The value of E shall not exceed the eight-hour time-weighted average (TWA) limit in Table 1 (see WAC 296-62-07515), for the material involved.

(b) To illustrate the formula, assume that substance A has an 8-hour time-weighted average limit of 100 ppm as noted in Table 1 of WAC 296-62-07515. Assume that an employee is subject to the following exposure:

Two hours exposure at 150 ppm

Two hours exposure at 75 ppm

Four hours exposure at 50 ppm

Substituting this information in the formula, we have

$$(2 \times 150 + 2 \times 75 + 4 \times 50) \div 8 = 81.25 \text{ ppm}$$

Since 81.25 ppm is less than 100 ppm, the 8-hour time-weighted average limit, the exposure is acceptable.

(3) Methods of compliance:

(a) To achieve compliance with these standards, the employer shall determine and implement feasible administrative or engineering controls.

(b) When administrative or engineering controls are not feasible to achieve full compliance, they shall nonetheless be used to reduce exposures to the lowest levels achievable by these controls.

(c) Any control equipment or technical measure utilized for the purpose of complying with WAC 296-62-07501(3) must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used their use shall comply with WAC 296-62-071 through 296-62-07121.

(d) Upon request, the employer shall prepare and submit a written compliance plan to the director. This plan must include a description of the manner in which compliance will be achieved with respect to cited violations of WAC 296-62-07501(3), and shall include proposed abatement methods, anticipated completion dates, and provision for progress reports to be sent to the department.

(4) An employee's exposure to any substance in Table 1 (see WAC 296-62-07515) which does not have a ceiling or a specified short-term exposure limit (STEL) shall not exceed the generic STEL which is computed by multiplying the applicable eight-hour time-weighted average (TWA) for the substance by the appropriate multiplier listed below.

Eight-hour TWA	Multiplier
PEL > 0-1	(ppm or mg/M ³) x 3
PEL > 1-10	(ppm or mg/M ³) x 2
PEL > 10-100	(ppm or mg/M ³) x 1.5
PEL > 100-1000	(ppm or mg/M ³) x 1.25
PEL > 1000	(ppm or mg/M ³) x 1

(5) Permissible limits are based on the best available information from industrial experience, from experimental human and animal studies, and, when possible, from a combination of the three. The basis on which the values are established may differ from substance to substance; protection against impairment of health may be a guiding factor for some, whereas reasonable freedom from irritation, narcosis, nuisance or other forms of stress may form the basis for others.

(6) The limits based on physical irritation shall be considered no less binding than those based on physical impairment. There is increasing evidence that physical irritation may initiate, promote or accelerate physical impairment through interaction with other chemical or biologic agents.

(7) In spite of the fact that serious injury is not believed likely as a result of exposure to the permissible limit concentrations, the best practice is to maintain concentrations of all atmospheric contaminants as low as is practical.

(8) These limits are intended for use in the practice of industrial hygiene and should be interpreted and applied only by a technically qualified person.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07501, filed 9/5/97, effective 11/5/97. Statutory Authority: Chapter 49.17 RCW. 89-15-002 (Order 89-06), § 296-62-07501, filed 7/6/89, effective 8/7/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-07501, filed 1/15/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-015 (Order 81-20), § 296-62-07501, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-07501, filed 8/8/80; Order 73-3, § 296-62-07501, filed 5/7/73.]

WAC 296-62-07503 Ceiling vs. time-weighted average limits. (1) Although the time-weighted average concentration provides the most satisfactory, practical way of monitoring airborne agents for compliance with the limits, there are certain substances for which it is inappropriate. In the latter group are substances which are predominantly fast acting and whose permissible limit is based on this particular response. Substances with this type of response are controlled by a ceiling limit that shall not be exceeded during any part of the work day. It is implicit in these definitions that the manner of sampling to determine compliance with the limits for each group must differ; a single brief sample, that is applicable to a ceiling limit, is not appropriate to the time-weighted limit; here, a sufficient number of samples are needed to determine a time-weighted average concentration throughout a complete cycle of operations or throughout the work shift.

(2) Whereas the ceiling limit places a definite boundary which concentrations shall not be permitted to exceed, the

time-weighted average limit requires an explicit limit to the excursions that are permissible above the listed values. The magnitude of these excursions are limited by an appropriate factor shown in WAC 296-62-07501(4).

[Statutory Authority: Chapter 49.17 RCW. 89-15-002 (Order 89-06), § 296-62-07503, filed 7/6/89, effective 8/7/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 80-11-010 (Order 80-14), § 296-62-07503, filed 8/8/80; Order 73-3, § 296-62-07503, filed 5/7/73.]

WAC 296-62-07505 "Skin" notation. Listed substances marked with an "X" in the "skin" column of Table 1 refer to the potential contribution to the overall exposure by the cutaneous route including mucous membranes and eye, either by airborne, or more particularly, by direct contact with the substance. Vehicles can alter skin absorption. Measures for the prevention of cutaneous absorption so that the permissible limit is not invalidated shall be taken. Such measures may include the use of gloves, coveralls, goggles, or other appropriate personal protective equipment, engineering controls or other work practices.

[Statutory Authority: Chapter 49.17 RCW. 89-15-002 (Order 89-06), § 296-62-07505, filed 7/6/89, effective 8/7/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 80-11-010 (Order 80-14), § 296-62-07505, filed 8/8/80; Order 73-3, § 296-62-07505, filed 5/7/73.]

WAC 296-62-07507 Mixtures. Special consideration shall be given to assessing the health hazards associated with exposure to mixtures of two or more substances which have similar health effects.

(1) In case of a mixture of air-contaminants compute the equivalent exposure as follows:

$$E_m = \frac{C_1}{L_1} + \frac{C_2}{L_2} + \dots + \frac{C_n}{L_n}$$

Where:

- E_m is the equivalent exposure for the mixture.
- C is the concentration of a particular contaminant.
- L is the exposure limit for that contaminant, from Table 1 or 2.
- The value of E_m shall not exceed unity (1).

(2) To illustrate the formula consider the following exposures:

Substance	Actual concentration of 8 hour exposure (ppm)	8 hr. TWA PEL (ppm)
B	500	1000
C	45	200
D	40	200

Substituting in the formula, we have:
 $E_m = 500 \div 1,000 + 45 \div 200 + 40 \div 200$
 $E_m = 0.500 + 0.225 + 0.200$
 $E_m = 0.925$

Since E_m is less than unity (1), the exposure combination is within acceptable limits.

[Statutory Authority: Chapter 49.17 RCW. 90-03-029 (Order 89-20), § 296-62-07507, filed 1/11/90, effective 2/26/90; 89-15-002 (Order 89-06), § 296-

62-07507, filed 7/6/89, effective 8/7/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 80-11-010 (Order 80-14), § 296-62-07507, filed 8/8/80; Order 73-3, § 296-62-07507, filed 5/7/73.]

WAC 296-62-07509 Nuisance dusts. (1) In contrast to fibrogenic dusts which cause scar tissue to be formed in lungs when inhaled in excessive amounts, so-called "nuisance" dusts have a long history of little adverse effect on lungs and do not produce significant organic disease or toxic effect when exposures are kept under reasonable control. The nuisance dusts have also been called (biologically) "inert" dusts, but the latter term is inappropriate to the extent that there is no dust which does not evoke some cellular response in the lung when inhaled in sufficient amount. However, the lung-tissue reaction caused by inhalation of nuisance dusts has the following characteristics:

- (a) The architecture of the air spaces remains intact,
 - (b) Collagen (scar tissue) is not formed to a significant extent,
 - (c) The tissue reaction is potentially reversible.
- (2) Excessive concentrations of nuisance dusts in the workroom air may seriously reduce visibility, may cause unpleasant deposits in the eyes, ears and nasal passages, or cause injury to the skin or mucous membranes by chemical or mechanical action per se or by the rigorous skin cleansing procedures necessary for their removal.

(3) A permissible limit of 10 milligrams per cubic meter, of total dust < 1% SiO₂, or 5.0 mg/m₃, respirable fraction, time weighted average, is mandatory for substances in these categories and for which no specific permissible limits have been assigned. This limit does not apply to those substances which may cause physiologic impairment at lower concentrations but for which a threshold limit has not yet been adopted.

(4) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name, are covered by the particulate not otherwise regulated (PNOR) limit in Table 1: Limits for air contaminants, except: The exemption specified in subsection (3) of this section.

[Statutory Authority: Chapter 49.17 RCW. 93-01-067 (Order 92-15), § 296-62-07509, filed 12/11/92, effective 1/15/93. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 80-11-010 (Order 80-14), § 296-62-07509, filed 8/8/80; Order 73-3, § 296-62-07509, filed 5/7/73.]

WAC 296-62-07510 Total particulate. Total particulate exposure shall not exceed a permissible limit of 10 milligrams per cubic meter (mg/M³) of air for total dust or 5 milligrams per cubic meter (mg/M³) for respirable dust. The use of this eight-hour time-weighted-average exposure limit does not preclude the application of other applicable limits in WAC 296-62-075 through 296-62-07515. Nor does it preclude the use of WAC 296-62-060 when substances not specifically listed in Table 1 are found to require a lower limit. This section does, however, limit the combined total concentration of all particulate contaminants whether or not specifically listed in Table 1.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07510, filed 9/5/97, effective 11/5/97. Statutory Authority: Chapter 49.17 RCW. 89-15-002 (Order 89-06), § 296-62-07510, filed 7/6/89, effective 8/7/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 80-11-010 (Order 80-14), § 296-62-07510, filed 8/8/80.]

WAC 296-62-07511 Simple asphyxiants. "Inert" gases or vapors. A number of gases and vapors when present in high concentrations in air act primarily as simple asphyxiants without other significant physiologic effects. A PEL may not be established for each simple asphyxiant because the limiting factor is the available oxygen. The minimal oxygen content shall be 19.5 percent by volume under normal atmospheric pressure (equivalent to a partial pressure, pO_2 of 148 mm Hg). Atmospheres deficient in O_2 do not provide adequate warning and most simple asphyxiants are odorless. Several simple asphyxiants present an explosion hazard. Account shall be taken of this factor in limiting the concentration of the asphyxiant.

[Statutory Authority: Chapter 49.17 RCW. 89-15-002 (Order 89-06), § 296-62-07511, filed 7/6/89, effective 8/7/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 80-11-010 (Order 80-14), § 296-62-07511, filed 8/8/80; Order 73-3, § 296-62-07511, filed 5/7/73.]

WAC 296-62-07513 Physical factors. It is recognized that such physical factors as heat, ultraviolet and ionizing radiation, humidity, abnormal pressure and the like may place added stress on the body so that the effects from exposure at a permissible limit may be altered. Most of these stresses act adversely to increase the toxic response of a substance. Although most permissible limits have built-in safety factors to guard against adverse effects to moderate deviations from normal environments, the safety factors of most substances are not of such a magnitude as to take care of gross deviations.

[Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 80-11-010 (Order 80-14), § 296-62-07513, filed 8/8/80; Order 73-3, § 296-62-07513, filed 5/7/73.]

WAC 296-62-07515 Control of chemical agents. Chemical agents shall be controlled in such a manner that the workers exposure shall not exceed the applicable limits in WAC 296-62-075 through 296-62-07515.

TABLE 1: LIMITS FOR AIR CONTAMINANTS
Permissible Exposure Limits (PEL)

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	Designation
Abate, see Temephos								
Acetaldehyde	75-07-0	100	180	150	270			
Acetic acid	64-19-7	10	25					
Acetic anhydride	108-24-7					5.0	20	
Acetone	67-64-1	750	1800	1000	2400			
Acetonitrile	75-05-8	40	70	60	105			
2-Acetylaminofluorene (see WAC 296-62-073)	53-96-3							
Acetylene	74-86-2	Simple	Asphyxiant					
Acetylene dichloride (see 1,2-Dichloroethylene)								
Acetylene tetrabromide	79-27-6	1.0	14					
Acetylsalicylic acid (Aspirin)	50-78-2		5.0					
Acrolein	107-02-8	0.1	0.25	0.3	0.8			
Acrylamide	79-06-1		0.03					X
Acrylic acid	79-10-7	10	30					X
Acrylonitrile (see WAC 296-62-07336(3))	107-13-1							
Aldrin	309-00-2		0.25					X
Allyl alcohol	107-18-6	2.0	5.0	4.0	10			X
Allyl Chloride	107-05-1	1.0	3.0	2.0	6.0			
Allyl glycidyl ether (AGE)	106-92-3	5.0	22	10	44			
Allyl propyl disulfide	2179-59-1	2.0	12	3.0	18			
alpha-Alumina (see Aluminum oxide)	1344-28-1							
Total dust			10					
Respirable fraction			5.0 ^k					
Aluminum, metal and oxide (as Al)	7429-90-5							
Total dust			10					
Respirable fraction			5.0 ^k					
pyro powders			5.0					
welding fumes ^f			5.0					
soluble salts			2.0					
alkyls (NOC)			2.0					
Alundum (see Aluminum oxide)								
4-Aminodiphenyl (see WAC 296-62-073)	92-67-1							
2-Aminoethanol (see Ethanolamine)								
2-Aminopyridine	504-29-0	0.5	2.0					
Amitrole	61-82-5		0.2					

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	Designation
Ammonia	7664-41-7	25	18	35	27	—	—	—
Ammonium chloride, fume	12125-02-9	—	10	—	20	—	—	—
Ammonium sulfamate (Ammate)	7773-06-0	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
n-Amyl acetate	628-63-7	100	525	—	—	—	—	—
sec-Amyl acetate	626-38-0	125	650	—	—	—	—	—
Aniline and homologues	62-53-3	2.0	8.0	—	—	—	—	X
Anisidine (o, p-isomers)	29191-52-4	0.1	0.5	—	—	—	—	X
Antimony and compounds (as Sb)	7440-36-0	—	0.5	—	—	—	—	—
ANTU (alpha Naphthyl thiourea)	86-88-4	—	0.3	—	—	—	—	—
Argon	7440-37-1	Simple	Asphyxiant	—	—	—	—	—
Arsenic,	7440-38-2	—	0.2	—	—	—	—	—
Organic compounds (as As)	—	—	—	—	—	—	—	—
Arsenic, Inorganic	7440-38-2	—	0.01	—	—	—	—	—
compounds (as As) (when use is covered by WAC 296-62-07347)	—	—	—	—	—	—	—	—
Arsenic, Inorganic	7440-38-2	—	0.2	—	—	—	—	—
compounds (as As) (when use is not covered by WAC 296-62-07347)	—	—	—	—	—	—	—	—
Arsine	7784-42-1	0.05	0.2	—	—	—	—	—
Asbestos	—	—	—	—	—	—	—	—
(see WAC 296-62-077 through 296-62-07753)	—	—	—	—	—	—	—	—
Asphalt (Petroleum fumes)	8052-42-4	—	5.0	—	—	—	—	—
Atrazine	1912-24-9	—	5.0	—	—	—	—	—
Azinphos methyl	86-50-0	—	0.2	—	—	—	—	X
Barium, soluble	7440-39-3	—	0.5	—	—	—	—	—
compounds (as Ba)	—	—	—	—	—	—	—	—
Barium Sulfate	7727-43-7	—	—	—	—	—	—	—
Total dust	—	—	10.0	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Benomyl	17804-35-2	—	—	—	—	—	—	—
Total dust	—	0.8	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Benzene	71-43-2	1.0	—	5.0	—	—	—	—
(see WAC 296-62-07523) ^d	—	—	—	—	—	—	—	—
Benzidine	92-87-5	—	—	—	—	—	—	—
(see WAC 296-62-073)	—	—	—	—	—	—	—	—
p-Benzoquinone	—	—	—	—	—	—	—	—
(see Quinone)	—	—	—	—	—	—	—	—
Benzo(a) pyrene	—	—	—	—	—	—	—	—
(see Coal tar pitch volatiles)	—	—	—	—	—	—	—	—
Benzoyl peroxide	94-36-0	—	5.0	—	—	—	—	—
Benzyl chloride	100-44-7	1.0	5.0	—	—	—	—	—
Beryllium and beryllium	7440-41-7	—	0.002	—	0.005	—	0.025	—
compounds (as Be)	—	—	—	—	(30 min.)	—	—	—
Biphenyl (see Diphenyl)	—	—	—	—	—	—	—	—
Bismuth telluride, Undoped	1304-82-1	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Bismuth telluride, Se-doped	—	—	5.0	—	—	—	—	—
Borates, tetra, sodium salts	—	—	—	—	—	—	—	—
Anhydrous	1330-43-4	—	1.0	—	—	—	—	—
Decahydrate	1303-96-4	—	5.0	—	—	—	—	—
Pentahydrate	12179-04-3	—	1.0	—	—	—	—	—
Boron oxide	1303-86-2	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Boron tribromide	10294-33-4	—	—	—	—	1.0	10	—
Boron trifluoride	7637-07-2	—	—	—	—	1.0	3.0	—
Bromacil	314-40-9	1.0	10	—	—	—	—	—
Bromine	7726-95-6	0.1	0.7	0.3	2.0	—	—	—
Bromine pentafluoride	7789-30-2	0.1	0.7	—	—	—	—	—
Bromochloromethane	—	—	—	—	—	—	—	—
(see Chlorobromomethane)	—	—	—	—	—	—	—	—
Bromoform	15-25-2	0.5	5.0	—	—	—	—	X
Butadiene	106-99-0	1	2.2	5	—	—	—	—
(1,3-butadiene)	—	—	—	—	—	—	—	—

General Occupational Health Standards

296-62-07515

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	Designation
Butane	106-97-8	800	1,900	—	—	—	—	—
Butanethiol (see Butyl mercaptan)	—	—	—	—	—	—	—	—
2-Butanone (Methyl ethyl ketone)	78-93-3	200	590	300	885	—	—	—
2-Butoxy ethanol (Butyl Cellosolve)	111-76-2	25	120	—	—	—	—	X
n-Butyl acetate	123-86-4	150	710	200	950	—	—	—
sec-Butyl acetate	105-46-4	200	950	—	—	—	—	—
tert-Butyl acetate	540-88-5	200	950	—	—	—	—	—
Butyl acrylate	141-32-2	10	55	—	—	—	—	—
n-Butyl alcohol	71-36-3	—	—	—	—	50	150	X
sec-Butyl alcohol	78-92-2	100	305	—	—	—	—	—
tert-Butyl alcohol	75-65-0	100	300	150	450	—	—	—
Butylamine	109-73-9	—	—	—	—	5.0	15	X
tert-Butyl chromate (see CrO ₃)	1189-85-1	—	—	—	—	—	0.1	X
n-Butyl glycidyl ether (BGE)	2426-08-6	25	135	—	—	—	—	—
n-Butyl lactate	138-22-7	5.0	25	—	—	—	—	—
Butyl mercaptan	109-79-5	0.5	1.5	—	—	—	—	—
o-sec-Butylphenol	89-72-5	5.0	30	—	—	—	—	X
p-tert-Butyl-toluene	98-51-1	10	60	20	120	—	—	—
Cadmium oxide fume (as Cd) (see WAC 296-62-074)	1306-19-0	—	—	—	—	—	—	—
Cadmium dust and salts (as Cd) (see WAC 296-62-074)	7440-43-9	—	—	—	—	—	—	—
Calcium arsenate (see WAC 296-62-07347)	—	—	—	—	—	—	—	—
Calcium carbonate	1317-65-3	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Calcium cyanamide	156-62-7	—	0.5	—	—	—	—	—
Calcium hydroxide	1305-62-0	—	5.0	—	—	—	—	—
Calcium oxide	1305-78-8	—	2.0	—	—	—	—	—
Calcium silicate	1344-95-2	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Calcium sulfate	7778-18-9	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Camphor (synthetic)	76-22-2	—	2.0	—	—	—	—	—
Caprolactam	105-60-2	—	—	—	—	—	—	—
Dust	—	—	1.0	—	3.0	—	—	—
Vapor	—	5.0	20	10	40	—	—	—
Captafol (Difolatan)	2425-06-1	—	0.1	—	—	—	—	X
Captan	133-06-2	—	5.0	—	—	—	—	—
Carbaryl (Sevin)	63-25-2	—	5.0	—	—	—	—	—
Carbofuran (Furadon)	1563-66-2	—	0.1	—	—	—	—	—
Carbon black	1333-86-4	—	3.5	—	—	—	—	—
Carbon dioxide	124-38-9	5,000	9,000	30,000	54,000	—	—	—
Carbon disulfide	75-15-0	4.0	12	12	36	—	—	X
Carbon monoxide	630-08-0	35	40	—	—	200 ^j	229 ^j	—
Carbon tetrabromide	558-13-4	0.1	1.4	0.3	4.0	—	—	—
Carbon tetrachloride	56-23-5	2.0	12.6	—	—	—	—	X
Carbonyl chloride (see Phosgene)	—	—	—	—	—	—	—	—
Carbonyl fluoride	353-50-4	2.0	5.0	5.0	15	—	—	—
Catechol (Pyrocatechol)	120-80-9	5.0	20	—	—	—	—	X
Cellulose (paper fiber)	9004-34-6	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Cesium hydroxide	21351-79-1	—	2.0	—	—	—	—	—
Chlordane	57-74-9	—	0.5	—	—	—	—	X
Chlorinated camphene	8001-35-2	—	0.5	—	1.0	—	—	X
Chlorinated diphenyl oxide	55720-99-5	—	0.5	—	—	—	—	—
Chlorine	7782-50-5	0.5	1.5	1.0	3.0	1.0	3.0	—
Chlorine dioxide	10049-04-4	0.1	0.3	0.3	0.9	—	—	—
Chlorine trifluoride	7790-91-2	—	—	—	—	0.1	0.4	—
Chloroacetaldehyde	107-20-0	—	—	—	—	1.0	3.0	—
a-Chloroacetophenone (Phenacyl chloride)	532-21-4	0.05	0.3	—	—	—	—	—

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	Designation
Chloroacetyl chloride	79-04-9	0.05	0.2	—	—	—	—	—
Chlorobenzene	108-90-7	75	350	—	—	—	—	—
(Monochlorobenzene)								
o-Chlorobenzylidene malononitrile (OCBM)	2698-41-1	—	—	—	—	0.05	0.4	X
Chlorobromomethane	74-97-5	200	1,050	—	—	—	—	—
2-Chloro-1, 3-butadiene (see beta-Chloroprene)	—	—	—	—	—	—	—	—
Chlorodifluoromethane	75-45-6	1,000	3,500	—	—	—	—	—
Chlorodiphenyl (42% Chlorine) (PCB)	53469-21-9	—	1.0	—	—	—	—	X
Chlorodiphenyl (54% Chlorine) (PCB)	11097-69-1	—	0.5	—	—	—	—	X
1-Chloro-2, 3-epoxypropane (see Epichlorhydrin)	—	—	—	—	—	—	—	—
2-Chloroethanol (see Ethylene chlorohydrin)	—	—	—	—	—	—	—	—
Chloroethylene (see vinyl chloride)	—	—	—	—	—	—	—	—
Chloroform (Trichloromethane)	67-66-3	2.0	9.78	—	—	—	—	—
1-Chloro-1-nitropropane	600-25-9	2.0	10	—	—	—	—	—
bis-Chloromethyl ether (see WAC 296-62-073)	542-88-1	—	—	—	—	—	—	—
Chloromethyl methyl ether (see Methyl carbomethyl ether)	107-30-2	—	—	—	—	—	—	—
Chloropentafluoroethane	76-15-3	1,000	6,320	—	—	—	—	—
Chloropicrin	76-06-2	0.1	0.7	—	—	—	—	—
beta-Chloroprene	126-99-8	10	35	—	—	—	—	X
o-Chlorostyrene	2039-87-4	50	285	75	428	—	—	—
o-Chlorotoluene	95-49-8	50	250	—	—	—	—	—
2-Chloro-6-trichloromethyl pyridine (see Nitrapyrin)	1929-82-4	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Chlorpyrifos	2921-88-2	—	0.2	—	—	—	—	X
Chromic acid and chromates (as CrO3)	Varies with compounds	—	—	—	—	—	0.1	—
Chromium, sol, chromic, chromous salts (as Cr)	7440-47-3	—	0.5	—	—	—	—	—
Chromium (VI) compounds (as Cr)	—	—	0.05	—	—	—	—	—
Chromium Metal and insoluble salts	7440-47-3	—	0.5	—	—	—	—	—
Chromyl chloride	14977-61-8	0.025	0.15	—	—	—	—	—
Chrysene (see Coal tar pitch volatiles)	—	—	—	—	—	—	—	—
Clopidol	2971-90-6	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Coal dust (less than 5% SiO2) Respirable fraction	—	—	2.0 ^g	—	—	—	—	—
Coal dust (greater than or equal to 5% SiO2) Respirable fraction	—	—	0.1 ^g	—	—	—	—	—
Coal tar pitch volatiles (benzene soluble fraction anthracene, BaP, phenanthrene, acri- dine, chrysene, pyrene)	65996-93-2	—	0.2	—	—	—	—	—
Cobalt, metal fume & dust (as Co)	7440-48-4	—	0.05	—	—	—	—	—
Cobalt carbonyl (as Co)	10210-68-1	—	0.1	—	—	—	—	—
Cobalt hydrocarbonyl (as Co)	16842-03-8	—	0.1	—	—	—	—	—
Coke oven emissions (see WAC 296-62-200)	—	—	—	—	—	—	—	—
Copper fume (as Cu)	7440-50-8	—	0.1	—	—	—	—	—
Dusts and mists (as Cu)	—	—	1.0	—	—	—	—	—
Cotton dust (raw) ^e	—	—	1.0	—	—	—	—	—
Corundum (see Aluminum oxide)	—	—	—	—	—	—	—	—

General Occupational Health Standards

296-62-07515

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	Designation
Crag herbicide (Sesone)	136-78-7	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Cresol (all isomers)	1319-77-3	5.0	22	—	—	—	—	X
Crotonaldehyde	123-73-9;	2.0	6.0	—	—	—	—	—
	4170-30-3	—	—	—	—	—	—	—
Crufomate	299-86-5	—	5.0	—	—	—	—	—
Cumene	98-82-8	50	245	—	—	—	—	X
Cyanamide	420-04-2	—	2.0	—	—	—	—	—
Cyanide (as CN)	Varies with compound	—	5.0	—	—	—	—	X
Cyanogen	460-19-5	10	20	—	—	—	—	—
Cyanogen chloride	506-77-4	—	—	—	—	0.3	0.6	—
Cyclohexane	110-82-7	300	1,050	—	—	—	—	—
Cyclohexanol	108-93-0	50	200	—	—	—	—	X
Cyclohexanone	108-94-1	25	100	—	—	—	—	X
Cyclohexene	110-83-8	300	1,015	—	—	—	—	—
Cyclohexylamine	108-91-8	10	40	—	—	—	—	—
Cyclonite (see RDX)	121-82-4	—	1.5	—	—	—	—	X
Cyclopentadiene	542-92-7	75	200	—	—	—	—	—
Cyclopentane	287-92-3	600	1,720	—	—	—	—	—
Cyhexatin	13121-70-5	—	5.0	—	—	—	—	—
2,4-D (Dichlorophenoxy-acetic acid)	94-75-7	—	10	—	—	—	—	—
DDT (Dichlorodiphenyltrichloroethane)	50-29-3	—	1.0	—	—	—	—	X
DDVP, Dichlorvos	62-73-7	0.1	1.0	—	—	—	—	X
Decaborane	17702-41-9	0.05	0.3	0.15	0.9	—	—	X
Demeton	8065-48-3	0.01	0.1	—	—	—	—	X
Diacetone alcohol	123-42-2	50	240	—	—	—	—	—
(4-hydroxy-4-methyl-2-pentanone)	—	—	—	—	—	—	—	—
1, 2-Diaminoethane (see Ethylenediamine)	—	—	—	—	—	—	—	—
Diazinon	333-41-5	—	0.1	—	—	—	—	X
Diazomethane	334-88-3	0.2	0.4	—	—	—	—	—
Diborane	19287-45-7	0.1	0.1	—	—	—	—	—
Dibrom (see Naled)	—	—	—	—	—	—	—	—
1, 2-Dibromo-3-chloropropane (DBCP) (see WAC 296-62-07342)	96-12-8	—	—	—	—	—	—	—
2-N-Dibutylamino ethanol	102-81-8	2.0	14	—	—	—	—	X
Dibutyl phosphate	107-66-4	1.0	5.0	2.0	10	—	—	—
Dibutyl phthalate	84-74-2	—	5.0	—	—	—	—	—
Dichloroacetylene	7572-29-4	—	—	—	—	0.1	0.4	—
o-Dichlorobenzene	95-50-1	—	—	—	—	50	300	—
p-Dichlorobenzene	106-46-7	75	450	110	675	—	—	—
3, 3'-Dichlorobenzidine (see WAC 296-62-073)	91-94-1	—	—	—	—	—	—	—
Dichlorodifluoromethane	75-71-8	1,000	4,950	—	—	—	—	—
1, 3-Dichloro-5, 5-dimethyl hydantoin	118-52-5	—	0.2	—	0.4	—	—	—
1, 1-Dichloroethane	75-34-3	100	400	—	—	—	—	—
1, 2-Dichloroethane (see Ethylene dichloride)	—	—	—	—	—	—	—	—
1, 2-Dichloroethylene	540-59-0	200	790	—	—	—	—	—
1, 1-Dichloroethylene (see Vinylidene chloride)	—	—	—	—	—	—	—	—
Dichloroethyl ether	111-44-4	5.0	30	10	60	—	—	X
Dichlorofluoromethane	75-43-4	10	40	—	—	—	—	—
Dichloromethane (see Methylene chloride)	—	—	—	—	—	—	—	—
1, 1-Dichloro-1-nitroethane	594-72-9	2.0	10.	10.	—	—	—	—
1, 2-Dichloropropane (see Propylene dichloride)	—	—	—	—	—	—	—	—
Dichloropropene	542-75-6	1.0	5.0	—	—	—	—	X
2, 2-Dichloropropionic acid	75-99-0	1.0	6.0	—	—	—	—	—
Dichlorotetrafluoroethane	76-14-2	1,000	7,000	—	—	—	—	—
Dichlorvos (DDVP)	62-73-7	0.1	1.0	—	—	—	—	X
Dicrotophos	141-66-2	—	0.25	—	—	—	—	X
Dicyclopentadiene	77-73-6	5.0	30	—	—	—	—	—

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m ^{3b}	ppm ^a	_mg/m ^{3b}	ppm ^a	_mg/m ^{3b}	Designation
Dicyclopentadienyl iron	102-54-5							
Total dust		—	10	—	—	—	—	—
Respirable fraction		—	5.0 ^k	—	—	—	—	—
Dieldrin	60-57-1	—	0.25	—	—	—	—	X
Diethanolamine	111-42-2	3.0	15	—	—	—	—	—
Diethylamine	109-89-7	10	30	25	75	—	—	—
2-Diethylaminoethanol	100-37-8	10	50	—	—	—	—	X
Diethylene triamine	111-40-0	1.0	4.0	—	—	—	—	X
Diethyl ether (see Ethyl ether)		—	—	—	—	—	—	—
Diethyl ketone	96-22-0	200	705	—	—	—	—	—
Diethyl phthalate	84-66-2	—	5.0	—	—	—	—	—
Difluorodibromomethane	75-61-6	100	860	—	—	—	—	—
Diglycidyl ether (DGE)	2238-07-5	0.1	0.5	—	—	—	—	—
Dihydroxybenzene (see Hydroquinone)		—	—	—	—	—	—	—
Diisobutyl ketone	108-83-8	25	150	—	—	—	—	—
Diisopropylamine	108-18-9	5.0	20	—	—	—	—	X
Dimethoxymethane (see Methylal)		—	—	—	—	—	—	—
Dimethyl acetamide	127-19-5	10	35	—	—	—	—	X
Dimethylamine	124-40-3	10	18	—	—	—	—	—
4-Dimethylaminoazobenzene (see WAC 296-62-073)	60-11-7	—	—	—	—	—	—	—
Dimethylaminobenzene (see Xylidene)		—	—	—	—	—	—	—
Dimethylaniline (N, N-Dimethylaniline)	121-69-7	5.0	25	10	50	—	—	X
Dimethylbenzene (see Xylene)		—	—	—	—	—	—	—
Dimethyl-1, 2-dibromo-2, 2-dichloroethyl phosphate (see Naled)	300-76-5	—	3.0	—	—	—	—	X
Dimethylformamide	68-12-2	10	30	—	—	—	—	X
2, 6-Dimethylheptanone (see Diisobutyl ketone)		—	—	—	—	—	—	—
1, 1-Dimethylhydrazine	57-14-7	0.5	1.0	—	—	—	—	X
Dimethyl phthalate	131-11-3	—	5.0	—	—	—	—	—
Dimethyl sulfate	77-78-1	0.1	0.5	—	—	—	—	X
Dinitolmide (3, 5-Dinitro-o-toluamide)	148-01-6	—	5.0	—	—	—	—	—
Dinitrobenzene (all isomers)	(alpha) 528-29-0; (meta) 99-65-0; (para) 100-25-4	0.15	1.0	—	—	—	—	X
Dinitro-o-cresol	534-52-1	—	0.2	—	—	—	—	X
Dinitrotoluene	25321-14-6	—	1.5	—	—	—	—	X
Dioxane (Diethylene dioxide)	123-91-1	25	90	—	—	—	—	X
Dioxathion	78-34-2	—	0.2	—	—	—	—	X
Diphenyl (Biphenyl)	92-52-4	0.2	1.0	—	—	—	—	—
Diphenylamine	122-39-4	—	10	—	—	—	—	—
Diphenylmethane diisocyanate (see Methylene bisphenyl isocyanate (MDI))		—	—	—	—	—	—	—
Dipropylene glycol methyl ether	34590-94-8	100	600	150	900	—	—	X
Dipropyl ketone	123-19-3	50	235	—	—	—	—	—
Diquat	85-00-7	—	0.5	—	—	—	—	—
Di-sec, Octyl phthalate (Di-2-ethylhexylphthalate)	117-81-7	—	5.0	—	10	—	—	—
Disulfiram	97-77-8	—	2.0	—	—	—	—	—
Disulfoton	298-04-4	—	0.1	—	—	—	—	X
2, 6-Di-tert-butyl-p-cresol	128-37-0	—	10	—	—	—	—	—
Diuron	330-54-1	—	10	—	—	—	—	—
Divinyl benzene	1321-74-0	10	50	—	—	—	—	—
Emery	12415-34-8	—	—	—	—	—	—	—
Total dust		—	10	—	—	—	—	—
Respirable fraction		—	5.0 ^k	—	—	—	—	—
Endosulfan (Thiodan)	115-29-7	—	0.1	—	—	—	—	X
Endrin	72-20-8	—	0.1	—	—	—	—	X
Epichlorhydrin	106-89-8	2.0	8.0	—	—	—	—	X
EPN	2104-64-5	—	0.5	—	—	—	—	X
1, 2-Epoxypropane (see Propylene oxide)		—	—	—	—	—	—	—
2, 3-Epoxy-1-propanol (see Glycidol)		—	—	—	—	—	—	—
Ethane		Simple	Asphyxiant	—	—	—	—	—

General Occupational Health Standards

296-62-07515

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	Designation
Ethanethiol (see Ethyl mercaptan)								
Ethanolamine	141-43-5	3.0	8.0	6.0	15			
Ethion	563-12-2		0.4					X
2-Ethoxyethanol	110-80-5	5.0	19					X
2-Ethoxyethyl acetate (Cellosolve acetate)	111-15-9	5.0	27					X
Ethyl acetate	141-78-6	400	1,400					
Ethyl acrylate	140-88-5	5.0	20	25	100			X
Ethyl alcohol (ethanol)	64-17-5	1,000	1,900					
Ethylamine	75-04-07	10	18					
Ethyl amyl ketone (5-Methyl-3-heptanone)	541-85-5	25	130					
Ethyl benzene	100-41-4	100	435	125	545			
Ethyl bromide	74-96-4	200	890	250	1,110			
Ethyl butyl ketone (3-Heptanone)	106-35-4	50	230					
Ethyl chloride	75-00-3	1,000	2,600					
Ethylene	74-85-1	Simple	Asphyxiant					
Ethylene chlorohydrin	107-07-3					1.0	3.0	X
Ethylenediamine	107-15-3	10	25					X
Ethylene dibromide	106-93-4	0.1		0.5				
Ethylene dichloride	107-06-2	1.0	4.0	2.0	8.0			
Ethylene glycol	107-21-1					50	125	
Ethylene glycol dinitrate	628-96-6				0.1			X
Ethylene glycol monomethyl ether acetate (Methyl cellosolve acetate)		5.0	24					X
Ethyleneimine (see WAC 296-62-073)	151-56-4							X
Ethylene oxide (see WAC 296-62-07359)	75-21-8	1.0	2.0					
Ethyl ether	60-29-7	400	1,200	500	1,500			
Ethyl formate	109-94-4	100	300					
Ethylidene chloride (see 1, 1-Dichloroethane)								
Ethylidene norbornene	16219-75-3					5.0	25	
Ethyl mercaptan	75-08-1	0.5	1.0					
n-Ethylmorpholine	100-74-3	5.0	23					X
Ethyl sec-amyl ketone (5-methyl-3-heptanone)		25	130					
Ethyl silicate	78-10-4	10	85					
Fenamiphos	22224-92-6		0.1					X
Fensulfothion (Dasanit)	115-90-2		0.1					
Fenthion	55-38-9		0.2					X
Ferbam	14484-64-1							
Total dust			10					
Ferrovandium dust	12604-58-9		1.0		3.0			
Fluorides (as F)			2.5					
Fluorine	7782-41-4	0.1	0.2					
Fluorotrichloromethane (see Trichlorofluoro methane)	75-69-4					1,000	5,600	
Fonofos	944-22-9		0.1					X
Formaldehyde (see WAC 296-62-07540)	50-00-0	0.75		2.0				
Formamide	75-12-7	20	30	30	45			
Formic acid	64-18-6	5.0	9.0					
Furfural	98-01-1	2.0	8.0					X
Furfuryl alcohol	98-00-0	10	40	15	60			X
Gasoline	8006-61-9	300	900	500	1,500			
Germanium tetrahydride	7782-65-2	0.2	0.6					
Glass, fibrous or dust			10					
Gluteraldehyde	111-30-8					0.2	0.8	
Glycerin mist	56-81-5							
Total dust			10					
Respirable fraction			5.0 ^k					
Glycidol (2, 3-Epoxy-1-propanol)	556-52-5	25	75					
Glycol monoethyl ether (see 2-Ethoxyethanol)								
Grain dust (oat, wheat, barley)			10					

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m ^{3b}	ppm ^a	_mg/m ^{3b}	ppm ^a	_mg/m ^{3b}	Designation
Graphite, natural	7782-42-5	—	—	—	—	—	—	—
Respirable dust	—	—	2.5 ^k	—	—	—	—	—
Graphite, Synthetic	—	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Guthion (see Azinphosmethyl)	—	—	—	—	—	—	—	—
Gypsum	13397-24-5	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Hafnium	7440-58-6	—	0.5	—	—	—	—	—
Helium	—	Simple	Asphyxiant	—	—	—	—	—
Heptachlor	76-44-8	—	0.5	—	—	—	—	X
Heptane (n-heptane)	142-82-5	400	1,600	500	2,000	—	—	—
2-Heptanone (see Methyl n-amyl ketone)	—	—	—	—	—	—	—	—
3-Heptanone (see Ethyl butyl ketone)	—	—	—	—	—	—	—	—
Hexachlorobutadiene	87-68-3	0.02	0.24	—	—	—	—	X
Hexachlorocyclopentadiene	77-47-4	0.01	0.1	—	—	—	—	—
Hexachloroethane	67-72-1	1.0	10	—	—	—	—	X
Hexachloronaphthalene	1335-87-1	—	0.2	—	—	—	—	X
Hexafluoroacetone	684-16-2	0.1	0.7	—	—	—	—	X
Hexane	—	—	—	—	—	—	—	—
n-hexane	110-54-3	50	180	—	—	—	—	—
other Isomers	Varies with compound	500	1,800	1,000	3,600	—	—	—
2-Hexanone (Methyl-n-butyl ketone)	591-78-6	5.0	20	—	—	—	—	—
Hexone (Methyl isobutyl ketone)	108-10-1	50	205	75	300	—	—	—
sec-Hexyl acetate	108-84-9	50	300	—	—	—	—	—
Hexylene Glycol	107-41-5	—	—	—	—	25	125	—
Hydrazine	302-01-2	0.1	0.1	—	—	—	—	X
Hydrogen	—	Simple	Asphyxiant	—	—	—	—	—
Hydrogenated terphenyls	61788-32-7	0.5	5.0	—	—	—	—	—
Hydrogen bromide	10035-10-6	—	—	—	—	3.0	10	—
Hydrogen chloride	7647-01-0	—	—	—	—	5.0	7.0	—
Hydrogen cyanide	74-90-8	—	—	4.7	5.0	—	—	X
Hydrogen fluoride	7664-39-3	—	—	—	—	3.0	2.5	—
Hydrogen peroxide	7722-84-1	1.0	1.4	—	—	—	—	—
Hydrogen selenide (as Se)	7783-07-5	0.05	0.2	—	—	—	—	—
Hydrogen Sulfide	7783-06-4	10	14	15	21	—	—	—
Hydroquinone	123-31-9	—	2.0	—	—	—	—	—
4-Hydroxy-4-methyl-2-pentanone (see Diacetone alcohol)	—	—	—	—	—	—	—	—
2-Hydroxypropyl acrylate	999-61-1	0.5	3.0	—	—	—	—	X
Indene	95-13-6	10	45	—	—	—	—	—
Indium and compounds (as In)	7440-74-6	—	0.1	—	—	—	—	—
Iodine	7553-56-2	—	—	—	—	0.1	1.0	—
Iodoform	75-47-8	0.6	10	—	—	—	—	—
Iron oxide dust and fume (as Fe)	1309-37-1	—	—	—	—	—	—	—
Total particulate	—	—	5.0	—	—	—	—	—
Iron pentacarbonyl (as Fe)	13463-40-6	0.1	0.8	0.2	1.6	—	—	—
Iron salts, soluble (as Fe)	Varies with compound	—	1.0	—	—	—	—	—
Isoamyl acetate	123-92-2	100	525	—	—	—	—	—
Isoamyl alcohol (primary and secondary)	123-51-3	100	360	125	450	—	—	—
Isobutyl acetate	110-19-0	150	700	—	—	—	—	—
Isobutyl alcohol	78-83-1	50	150	—	—	—	—	—
Isooctyl alcohol	26952-21-6	50	270	—	—	—	—	X
Isophorone	78-59-1	4.0	23	—	—	5.0	25	—
Isophorone diisocyanate	4098-71-9	0.005	0.045	0.02	—	—	—	X
Isopropoxyethanol	109-59-1	25	105	—	—	—	—	—
Isopropyl acetate	108-21-4	250	950	310	1,185	—	—	—
Isopropyl alcohol	67-63-0	400	980	500	1,225	—	—	—
Isopropylamine	75-31-0	5.0	12	10	24	—	—	—
N-Isopropylaniline	768-52-5	2.0	10	—	—	—	—	X
Isopropyl ether	108-20-3	250	1,050	—	—	—	—	—
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	75	360	—	—	—

General Occupational Health Standards

296-62-07515

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m ^{3b}	ppm ^a	_mg/m ^{3b}	ppm ^a	_mg/m ^{3b}	Designation
Kaolin								
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Ketene	463-51-4	0.5	0.9	1.5	3.0	—	—	—
Lead inorganic (as Pb) (see WAC 296-62-07521)	7439-92-1	—	0.05	—	—	—	—	—
Lead arsenate (see WAC 296-62-07347)	3687-31-8	—	0.05	—	—	—	—	—
Lead chromate	7758-97-6	—	0.05	—	—	—	—	—
Limestone	1317-65-3							
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Lindane	58-89-9	—	0.5	—	—	—	—	X
Lithium hydride	7580-67-8	—	0.025	—	—	—	—	—
L.P.G. (liquified petroleum gas)	68476-85-7	1,000	1,800	—	—	—	—	—
Magnesite	546-93-0							
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Magnesium oxide fume	1309-48-4							
Total particulate	—	—	10	—	—	—	—	—
Malathion	121-75-5							
Total dust	—	—	10	—	—	—	—	X
Maleic anhydride	108-31-6	0.25	1.0	—	—	—	—	—
Manganese and compound (as Mn)	7439-96-5	—	—	—	—	—	5.0	—
Manganese tetroxide and fume (as Mn)	7439-96-5	—	1.0	—	3.0	—	—	—
Manganese cyclopentadienyl tricarbonyl (as Mn)	12079-65-1	—	0.1	—	—	—	—	X
Manganese tetroxide (as Mn)	1317-35-7	—	1.0	—	—	—	—	—
Marble	1317-65-3							
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Mercury (aryl and inorganic) (as Hg)	7439-97-6	—	—	—	—	—	0.1	X
Mercury (organo-alkyl compounds) (as Hg)	7439-97-6	—	0.01	—	0.03	—	—	X
Mercury (vapor) (as Hg)	7439-97-6	—	0.05	—	—	—	—	X
Mesityl oxide	141-79-7	15	60	25	100	—	—	—
Methacrylic acid	79-41-4	20	70	—	—	—	—	X
Methane	—	Simple	Asphyxiant	—	—	—	—	—
Methanethiol (see Methyl mercaptan)	—	—	—	—	—	—	—	—
Methomyl (lannate)	16752-77-5	—	2.5	—	—	—	—	—
Methoxychlor	72-43-5							
Total dust	—	—	10	—	—	—	—	—
2-Methoxyethanol (Methyl cellosolve)	109-86-4	5.0	16	—	—	—	—	X
4-Methoxyphenol	150-76-5	—	5.0	—	—	—	—	—
Methyl acetate	79-20-9	200	610	250	760	—	—	—
Methyl acetylene (propyne)	74-99-7	1,000	1,650	—	—	—	—	—
Methyl acetylene-propadiene mixture (MAPP)	—	1,000	1,800	1,250	2,250	—	—	—
Methyl acrylate	96-33-3	10	35	—	—	—	—	X
Methylacrylonitrile	126-98-7	1.0	3.0	—	—	—	—	X
Methylal (Dimethoxy-methane)	109-87-5	1,000	3,100	—	—	—	—	—
Methyl alcohol (methanol)	67-56-1	200	260	250	325	—	—	X
Methylamine	74-89-5	10	12	—	—	—	—	—
Methyl amyl alcohol (see Methyl isobutyl carbinol)	—	—	—	—	—	—	—	—
Methyl n-amyl ketone (2-Heptanone)	110-43-0	50	235	—	—	—	—	—
N-Methyl aniline (see Monomethyl aniline)	—	—	—	—	—	—	—	—
Methyl bromide	74-83-9	5.0	20	—	—	—	—	X
Methyl butyl ketone (see 2-Hexanone)	—	—	—	—	—	—	—	—
Methyl cellosolve (see 2-Methoxyethanol)	109-86-4	5.0	16	—	—	—	—	X
Methyl cellosolve acetate (2-Methoxyethyl acetate)	110-49-6	5.0	24	—	—	—	—	X
Methyl chloride	74-87-3	50	105	100	210	—	—	—

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	Designation
Methyl chloroform (1, 1, 1-trichloroethane)	71-55-6	350	1,900	450	2,450	—	—	—
Methyl chloromethyl ether (see WAC 296-62-073)	107-30-2	—	—	—	—	—	—	—
Methyl 2-cyanoacrylate	137-05-3	2.0	8.0	4.0	16	—	—	—
Methylcyclohexane	108-87-2	400	1,600	—	—	—	—	—
Methylcyclohexanol	25639-42-3	50	235	—	—	—	—	—
Methylcyclohexanone	583-60-8	50	230	75	345	—	—	X
Methylcyclopentadienyl manganese tricarbonyl (as Mn)	12108-13-3	—	0.2	—	—	—	—	X
Methyl demeton	8022-00-2	—	0.5	—	—	—	—	X
Methylene bisphenyl isocyanate (MDI)	101-68-8	—	—	—	—	0.02	0.2	—
4, 4'-Methylene bis (2-chloroaniline (MBOCA)) (see WAC 296-62-073)	101-14-4	0.02	0.22	—	—	—	—	X
Methylene bis (4-cyclohexylisocyanate)	5124-30-1	—	—	—	—	0.01	0.11	—
Methylene chloride (see WAC 296-62-07470)	75-09-2	25	—	125	—	—	—	—
4, 4-Methylene dianiline	101-77-9	0.1	0.8	—	—	—	—	X
Methyl ethyl ketone (MEK) (see 2-Butanone)	78-93-3	—	—	—	—	—	—	—
Methyl ethyl ketone peroxide (MEKP)	1338-23-4	—	—	—	—	0.2	1.5	—
Methyl formate	107-31-3	100	250	150	375	—	—	—
5-Methyl-3-heptanone (see Ethyl amyl ketone)	—	—	—	—	—	—	—	—
Methyl hydrazine (see Monomethyl hydrazine)	60-34-4	—	—	—	—	0.2	0.35	X
Methyl iodide	74-88-4	2.0	10	—	—	—	—	X
Methyl isoamyl ketone	110-12-3	50	240	—	—	—	—	—
Methyl isobutyl carbinol	108-11-2	25	100	40	165	—	—	X
Methyl isobutyl ketone (see Hexone)	—	—	—	—	—	—	—	—
Methyl isocyanate	624-83-9	0.02	0.05	—	—	—	—	X
Methyl isopropyl ketone	563-80-4	200	705	—	—	—	—	—
Methyl mercaptan	74-93-1	0.5	1.0	—	—	—	—	—
Methyl methacrylate	80-62-6	100	410	—	—	—	—	—
Methyl parathion	298-00-0	—	0.2	—	—	—	—	X
Methyl propyl ketone (see 2-Pentanone)	—	—	—	—	—	—	—	—
Methyl silicate	684-84-5	1.0	6.0	—	—	—	—	—
alpha-Methyl styrene	98-83-9	50	240	100	485	—	—	—
Mevinphos (see Phosdrin)	—	—	—	—	—	—	—	—
Metribuzin	21087-64-9	—	5.0	—	—	—	—	—
Mica (see Silicates)	—	—	—	—	—	—	—	—
Molybdenum (as Mo)	7439-98-7	—	—	—	—	—	—	—
Soluble compounds	—	—	5.0	—	—	—	—	—
Insoluble compounds	—	—	—	—	—	—	—	—
Total dust	—	—	—	10	—	—	—	—
Monocrotophos (Azodrin)	6923-22-4	—	0.25	—	—	—	—	—
Monomethyl aniline	100-61-8	0.5	2.0	—	—	—	—	X
Monomethyl hydrazine	—	—	—	—	—	0.2	0.35	—
Morpholine	110-91-8	20	70	30	105	—	—	X
Naled	300-76-5	—	3.0	—	—	—	—	X
Naphtha (Coal tar)	8030-30-6	100	400	—	—	—	—	X
Naphthalene	91-20-3	10	50	15	75	—	—	—
alpha-Naphthylamine (see WAC 296-62-073)	134-32-7	—	—	—	—	—	—	—
beta-Naphthylamine (see WAC 296-62-073)	91-59-8	—	—	—	—	—	—	—
Neon	7440-01-9	Simple	Asphyxiant	—	—	—	—	—
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	—	—	—	—	—
Nickel (as Ni)	7440-02-0	—	—	—	—	—	—	—
Metal and insoluble compounds	—	—	1.0	—	—	—	—	—
Soluble compounds	—	—	0.1	—	—	—	—	—
Nicotine	54-11-5	—	0.5	—	—	—	—	X

General Occupational Health Standards

296-62-07515

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	Designation
Nitrapyrin (see 2-Chloro-6 trichloromethyl pyridine)	1929-82-4	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Nitric acid	7697-37-2	2.0	5.0	4.0	10	—	—	—
Nitric oxide	10102-43-9	25	30	—	—	—	—	—
p-Nitroaniline	100-01-6	—	3.0	—	—	—	—	X
Nitrobenzene	98-95-3	1.0	5.0	—	—	—	—	X
4-Nitrobiphenyl (see WAC 296-62-073)	92-93-3	—	—	—	—	—	—	—
p-Nitrochlorobenzene	100-00-5	—	0.5	—	—	—	—	X
4-Nitrodiphenyl (see WAC 296-62-073)	—	—	—	—	—	—	—	—
Nitroethane	79-24-3	100	310	—	—	—	—	—
Nitrogen	7727-37-9	Simple	Asphyxiant	—	—	—	—	—
Nitrogen dioxide	10102-44-0	—	—	1.0	1.8	—	—	—
Nitrogen trifluoride	7783-54-2	10	29	—	—	—	—	—
Nitroglycerin	55-63-0	—	—	—	0.1	—	—	X
Nitromethane	75-52-5	100	250	—	—	—	—	—
1-Nitropropane	108-03-2	25	90	—	—	—	—	—
2-Nitropropane	79-46-9	10	35	—	—	—	—	—
N-Nitrosodimethylamine (see WAC 296-62-073)	62-75-9	—	—	—	—	—	—	—
Nitrotoluene	—	—	—	—	—	—	—	—
o-isomer	88-72-2	2.0	11	—	—	—	—	X
m-isomer	98-08-2	2.0	11	—	—	—	—	X
p-isomer	99-99-0	2.0	11	—	—	—	—	X
Nitrotirchloromethane (see Chloropicrin)	—	—	—	—	—	—	—	—
Nitrous Oxide (Nitrogen oxide)	10024-97-2	50	90	—	—	—	—	—
Nonane	111-84-2	200	1,050	—	—	—	—	—
Octachloronaphthalene	2234-13-1	—	0.1	—	0.3	—	—	X
Octane	111-65-9	300	1,450	375	1,800	—	—	—
Oil mist, mineral (particulate)	8012-95-1	—	5.0	—	—	—	—	—
Osmium tetroxide (as Os)	20816-12-0	0.0002	0.002	0.0006	0.006	—	—	—
Oxalic acid	144-62-7	—	1.0	—	2.0	—	—	—
Oxygen difluoride	7783-41-7	—	—	—	—	0.05	0.1	—
Ozone	10028-15-6	0.1	0.2	0.3	0.6	—	—	—
Paraffin wax fume	8002-74-2	—	2.0	—	—	—	—	—
Paraquat (Respirable dust)	4685-14-7	—	0.1 ^k	—	—	—	—	X
	1910-42-5	—	—	—	—	—	—	—
	2074-50-2	—	—	—	—	—	—	—
Parathion	56-38-2	—	0.1	—	—	—	—	X
Particulate polycyclic aromatic hydrocarbons (see coal tar pitch volatiles)	—	—	—	—	—	—	—	—
Particulates not otherwise regulated (see WAC 296-62-07510)	—	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Pentaborane	19624-22-7	0.005	0.01	0.015	0.03	—	—	—
Pentachloronaphthalene	1321-64-8	—	0.5	—	—	—	—	X
Pentachlorophenol	87-86-5	—	0.5	—	—	—	—	X
Pentaerythritol	115-77-5	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Pentane	109-66-0	600	1,800	750	2,250	—	—	—
2-Pentanone (methyl propyl ketone)	107-87-9	200	700	250	875	—	—	—
Perchloroethylene (tetrachloroethylene)	127-18-4	25	170	—	—	—	—	—
Perchloromethyl mercaptan	594-42-3	0.1	0.8	—	—	—	—	—
Perchloryl fluoride	7616-94-6	3.0	14	6.0	28	—	—	—
Perlite	—	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Petroleum distillates (Naphtha) (Rubber Solvent)	—	100	400	—	—	—	—	—
Phenol	108-95-2	5.0	19	—	—	—	—	X

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	Designation
Phenothiazine	92-84-2	—	5.0	—	—	—	—	X
p-Phenylene diamine	106-50-3	—	0.1	—	—	—	—	X
Phenyl ether (vapor)	101-84-8	1.0	7.0	—	—	—	—	—
Phenyl ether-diphenyl mixture (vapor)	—	1.0	7.0	—	—	—	—	—
Phenylethylene (see Styrene)	—	—	—	—	—	—	—	—
Phenyl glycidyl ether (PGE)	122-60-1	1.0	6.0	—	—	—	—	—
Phenylhydrazine	100-63-0	5.0	20	10	45	—	—	X
Phenyl mercaptan	108-98-5	0.5	2.0	—	—	—	—	—
Phenylphosphine	638-21-1	—	—	—	—	0.05	0.25	—
Phorate	298-02-2	—	0.05	—	0.2	—	—	X
Phosdrin (Mevinphos)	7786-34-7	0.01	0.1	0.03	0.3	—	—	X
Phosgene (carbonyl chloride)	75-44-5	0.1	0.4	—	—	—	—	—
Phosphine	7803-51-2	0.3	0.4	1.0	1.0	—	—	—
Phosphoric acid	7664-38-2	—	1.0	—	3.0	—	—	—
Phosphorus (yellow)	7723-14-0	—	0.1	—	—	—	—	—
Phosphorous oxychloride	10025-87-3	0.1	0.6	—	—	—	—	—
Phosphorus pentachloride	10026-13-8	0.1	1.0	—	—	—	—	—
Phosphorus pentasulfide	1314-80-3	—	1.0	—	3.0	—	—	—
Phosphorus trichloride	7719-12-2	0.2	1.5	0.5	3.0	—	—	—
Phthalic anhydride	85-44-9	1.0	6.0	—	—	—	—	—
m-Phthalodinitrile	626-17-5	—	5.0	—	—	—	—	—
Picloram	1918-02-1	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Picric acid	88-89-1	—	0.1	—	—	—	—	X
Pindone	83-26-1	—	0.1	—	—	—	—	—
(2-Pivalyl-1, 3-indandione)	—	—	—	—	—	—	—	—
Piperazine dihydrochloride	142-64-3	—	5.0	—	—	—	—	—
Pival (see Pindone)	—	—	—	—	—	—	—	—
Plaster of Paris	26499-65-0	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Platinum (as Pt)	7440-06-4	—	—	—	—	—	—	—
Metal	—	—	1.0	—	—	—	—	—
Soluble salts	—	—	0.002	—	—	—	—	—
Polychlorobiphenyls (see Chlorodiphenyls)	—	—	—	—	—	—	—	—
Portland cement	65997-15-1	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Potassium hydroxide	1310-58-3	—	—	—	—	2.0	—	—
Propane	74-98-6	1,000	1,800	—	—	—	—	—
Propargyl alcohol	107-19-7	1.0	2.0	—	—	—	—	X
beta-Propiolactone (see WAC 296-62-073)	57-57-8	—	—	—	—	—	—	—
Propionic acid	79-09-4	10	30	—	—	—	—	—
Propoxur (Baygon)	114-26-1	—	0.5	—	—	—	—	—
n-Propyl acetate	109-60-4	200	840	250	1,050	—	—	—
n-Propyl alcohol	71-23-8	200	500	250	625	—	—	X
n-Propyl nitrate	627-13-4	25	105	40	170	—	—	—
Propylene	—	Simple	Asphyxiant	—	—	—	—	—
Propylene dichloride (1, 2-Dichloropropane)	78-87-5	75	350	110	510	—	—	—
Propylene glycol dinitrate	6423-43-4	0.05	0.3	—	—	—	—	X
Propylene glycol monomethyl ether	107-98-2	100	360	150	540	—	—	—
Propylene imine	75-55-8	2.0	5.0	—	—	—	—	X
Propylene oxide	75-56-9	20	50	—	—	—	—	—
Propyne (see Methyl acetylene)	—	—	—	—	—	—	—	—
Pyrethrum	8003-34-7	—	5.0	—	—	—	—	—
Pyridine	110-86-1	5.0	15	—	—	—	—	—
Quinone	106-51-4	0.1	0.4	—	—	—	—	—
RDX (see Cyclonite)	—	—	1.5	—	—	—	—	X
Resorcinol	108-46-3	10	45	20	90	—	—	—
Rhodium (as Rh)	7440-16-6	—	—	—	—	—	—	—
Insoluble compounds, Metal fumes and dusts	—	—	—	0.1	—	—	—	—
Soluble compounds, salts	—	—	0.001	—	—	—	—	—
Ronnel	299-84-3	—	10	—	—	—	—	—
Rosin core solder, pyrolysis products (as formaldehyde)	—	—	0.1	—	—	—	—	—

General Occupational Health Standards

296-62-07515

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	Designation
Rotenone	83-79-4	—	5.0	—	—	—	—	—
Rouge	—	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Rubber solvent (naphtha)	8002-05-9	100	400	—	—	—	—	—
Selenium compounds (as Se)	7782-49-2	—	0.2	—	—	—	—	—
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.2	—	—	—	—	—
Sesone (see Crag herbicide)	—	—	—	—	—	—	—	—
Silane (see Silicon tetrahydride)	—	—	—	—	—	—	—	—
Silica, amorphous, precipitated and gel	112926-00-8	—	6.0	—	—	—	—	—
Silica, amorphous, diatomaceous earth, containing less than 1% crystalline silica	61790-53-2	—	—	—	—	—	—	—
Total dust	—	—	6.0	—	—	—	—	—
Respirable fraction	—	—	3.0 ^k	—	—	—	—	—
Silica, crystalline	14464-46-1	—	0.05 ^k	—	—	—	—	—
cristobalite, respirable dust	—	—	—	—	—	—	—	—
Silica, crystalline quartz, respirable dust	14808-60-7	—	0.1 ^k	—	—	—	—	—
Silica, crystalline tripoli (as quartz), respirable dust	1317-95-9	—	0.1 ^k	—	—	—	—	—
Silica, crystalline tridymite, respirable dust	15468-32-3	—	0.05 ^k	—	—	—	—	—
Silica, fused, respirable dust	60676-86-0	—	0.1 ^k	—	—	—	—	—
Silicates (less than 1% crystalline silica)	—	—	—	—	—	—	—	—
Mica (Respirable dust)	12001-26-2	—	3.0 ^k	—	—	—	—	—
Soapstone, Total dust	—	—	6.0	—	—	—	—	—
Soapstone, Respirable dust	—	—	3.0 ^k	—	—	—	—	—
Talc (containing asbestos): use asbestos limit (see WAC 296-62-07705)	—	—	—	—	—	—	—	—
Talc (containing no asbestos), Respirable dust	14807-96-6	—	2.0 ^k	—	—	—	—	—
Tremolite (see WAC 296-62-07705)	—	—	—	—	—	—	—	—
Silicon	7440-21-3	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Silicon Carbide	409-21-2	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Silicon tetrahydride	7803-62-5	5.0	7.0	—	—	—	—	—
Silver, metal dust and soluble compounds (as Ag)	7440-22-4	—	0.01	—	—	—	—	—
Soapstone (see Silicates)	—	—	—	—	—	—	—	—
Sodium azide	26628-22-8	—	—	—	—	—	—	—
(as HN ₃)	—	—	—	—	—	0.1	0.3	X
(as NaN ₃)	—	—	—	—	—	0.1	0.3	X
Sodium bisulfite	7631-90-5	—	5.0	—	—	—	—	—
Sodium-2, 4-dichlorophenoxyethyl sulfate (see Crag herbicide)	—	—	—	—	—	—	—	—
Sodium fluoroacetate	62-74-8	—	0.05	—	0.15	—	—	X
Sodium hydroxide	1310-73-2	—	—	—	—	—	2.0	—
Sodium metabisulfite	7681-57-4	—	5.0	—	—	—	—	—
Starch	9005-25-8	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Stibine	7803-52-3	0.1	0.5	—	—	—	—	—
Stoddard solvent	8052-41-3	100	525	—	—	—	—	—
Strychnine	57-24-9	—	0.15	—	—	—	—	—
Styrene	100-42-5	50	215	100	425	—	—	—
Subtilisins	9014-01-1	—	—	—	0.00006 (60min.) ⁱ	—	—	—
Sucrose	57-50-1	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin Designation
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	
Sulfotep (see TEDP)								X
Sulfur dioxide	7446-09-5	2.0	5.0	5.0	13			
Sulfur hexafluoride	2551-62-4	1,000	6,000					
Sulfuric acid	7664-93-9		1.0					
Sulfur monochloride	10025-67-9					1.0	6.0	
Sulfur pentafluoride	5714-22-1					0.01	0.1	
Sulfur tetrafluoride	7783-60-0					0.1	0.4	
Sulfuryl fluoride	2699-79-8	5.0	20	10	40			
Sulprofos	35400-43-2		1.0					
Systox (see Demeton)								
2, 4, 5-T	93-76-5		10					
Talc (see Silicates)								
Tantalum	7440-25-7		5.0					
Metal and oxide dusts								
TEDP (Sulfotep)	3689-24-5		0.2					X
Tellurium and compounds (as Te)	13494-80-9		0.1					
Tellurium hexafluoride (as Te)	7783-80-4	0.02	0.2					
Temephos	3383-96-8							
Total dust			10					
Respirable fraction			5.0 ^k					
TEPP	107-49-3	0.004	0.05					X
Terphenyls	26140-60-3					0.5	5.0	
1, 1, 1, 2-Tetrachloro-2,2-difluoroethane	76-11-0	500	4,170					
1, 1, 2, 2-Tetrachloro-1,2-difluoroethane	76-12-0	500	4,170					
1, 1, 2, 2-Tetrachloroethane	79-34-5	1.0	7.0					X
Tetrachloroethylene								
(see Perchloroethylene)								
Tetrachloromethane								
(see Carbon tetrachloride)								
Tetrachloronaphthalene	1335-88-2		2.0					X
[Tetrachloronaphthalene]								
Tetraethyl lead (as Pb)	78-00-2		0.075					X
Tetrahydrofuran	109-99-9	200	590	250	735			
[Tetrahydrofuran]								
Tetramethyl lead (as Pb)	75-74-1		0.075					X
Tetramethyl succinonitrile	3333-52-6	0.5	3.0					X
Teranitimethane	509-14-8	1.0	8.0					
Tetrasodium pyrophosphate	7722-88-5		5.0					
Tetryl (2, 4, 6-trinitrophenylmethylnitramine)	479-45-8		1.5					X
Thallium (soluble compounds) (as Tl)	7440-28-0		0.1					X
4, 4-Thiobis	96-69-5							
(6-tert-butyl-m-cresol)								
Total dust			10					
Respirable fraction			5.0 ^k					
Thioglycolic acid	68-11-1	1.0	4.0					X
Thionyl chloride	7719-09-7					1.0	5.0	
Thiram	137-26-8		5.0					
(see WAC 296-62-07519)								
Tin (as Sn)	7440-31-5		2.0					
Inorganic compounds (except oxides)								
Tin, Organic compounds (as Sn)	7440-31-5		0.1					X
Tin Oxide (as Sn)	21651-19-4		2.0					
Titanium dioxide	13463-67-7							
Total dust			10					
Toulene [Toluene]	108-88-3	100	375	150	560			
Toluene-2, 4-diisocyanate (TDI)	584-84-9	0.005	0.04	0.02	0.15			
m-Toluidine	108-44-1	2.0	9.0					X
o-Toluidine	95-53-4	2.0	9.0					X
p-Toluidine	106-49-0	2.0	9.0					X
Toxaphene								
(see Chlorinated camphene)								
Tremolite (see Silicates)								
Tributyl phosphate	126-73-8	0.2	2.5					
Trichloroacetic acid	76-03-9	1.0	7.0					
1, 2, 4-Trichlorobenzene	120-82-1					5.0	40	
1, 1, 1-Trichloroethane								
(see Methyl chloroform)								

General Occupational Health Standards

296-62-07515

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin
		ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	ppm ^a	_mg/m3 ^b	Designation
1, 1, 2-Trichloroethane	79-00-5	10	45	—	—	—	—	—
Trichloroethylene	79-01-6	50	270	200	1,080	—	—	—
Trichlorofluoromethane	75-69-4	—	—	—	—	1,000	5,600	—
Trichloromethane (see Chloroform)	—	—	—	—	—	—	—	—
Trichloronaphthalene	1321-65-9	—	5.0	—	—	—	—	X
1, 2, 3-Trichloropropane	96-18-4	10	60	—	—	—	—	X
1, 1, 2-Trichloro-1, 2, 2-trifluoroethane	76-13-1	1,000	7,600	1,250	9,500	—	—	—
Tricyclohexyltin hydroxide (see Cyhexatin)	—	—	—	—	—	—	—	—
Triethylamine	121-44-8	10	40	15	60	—	—	—
Trifluorobromomethane	75-63-8	1,000	6,100	—	—	—	—	—
Trimellitic anhydride	552-30-7	0.005	0.04	—	—	—	—	—
Trimethylamine	75-50-3	10	24	15	36	—	—	—
Trimethyl benzene	25551-13-7	25	125	—	—	—	—	—
Trimethyl phosphite	121-45-9	2.0	10	—	—	—	—	—
2, 4, 6-Trinitrophenol (see Picric acid)	—	—	—	—	—	—	—	—
2, 4, 6-Trinitrophenyl- methylnitramine (see Tetryl)	—	—	—	—	—	—	—	—
2, 4, 6-Trinitrotoluene (TNT)	118-96-7	—	0.5	—	—	—	—	X
Triorthocresyl phosphate	78-30-8	—	0.1	—	—	—	—	X
Triphenyl amine	603-34-9	—	5.0	—	—	—	—	—
Triphenyl phosphate	115-86-6	—	3.0	—	—	—	—	—
Tungsten (as W)	7440-33-7	—	—	—	—	—	—	—
Soluble compounds	—	—	1.0	—	3.0	—	—	—
Insoluble compounds	—	—	5.0	—	10	—	—	—
Turpentine	8006-64-2	100	560	—	—	—	—	—
Uranium (as U)	7440-61-1	—	—	—	—	—	—	—
Soluble compounds	—	—	0.05	—	—	—	—	—
Insoluble compounds	—	—	0.2	—	0.6	—	—	—
n-Valeraldehyde	110-62-3	50	175	—	—	—	—	—
Vanadium (as V2O5)	1314-62-1	—	0.05	—	—	—	—	—
Respirable dust and fume	—	—	—	—	—	—	—	—
Vegetable oil mist	—	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Vinyl acetate	108-05-1	10	30	20	60	—	—	—
Vinyl benzene (see Styrene)	—	—	—	—	—	—	—	—
Vinyl bromide	593-60-2	5.0	20	—	—	—	—	—
Vinyl chloride	75-01-4	—	—	—	—	—	—	—
(see WAC 296-62-07329)	—	—	—	—	—	—	—	—
Vinyl cyanide (see Acrylonitrile)	—	—	—	—	—	—	—	—
Vinyl cyclohexene dioxide	106-87-6	10	60	—	—	—	—	X
Vinyl toluene	25013-15-4	50	240	—	—	—	—	—
Vinylidene chloride (1, 1-Dichloroethylene)	75-35-4	1.0	4.0	—	—	—	—	—
VM & P Naphtha	8032-32-4	300	1,350	400	1,800	—	—	—
Warfarin	81-81-2	—	0.1	—	—	—	—	—
Welding fumes ^f (total particulate)	—	—	5.0	—	—	—	—	—
Wood dust	—	—	—	—	—	—	—	—
Nonallergenic; All soft woods and hard woods except allergenics	—	—	5.0	—	10	—	—	—
Allergenics; (e.g. cedar, mahogany and teak)	—	—	2.5	—	—	—	—	—
Xylenes (Xylol) (o-, m-, p-isomers)	1330-20-7	100	435	150	655	—	—	—
m-Xylene alpha, alpha-diamine	1477-55-0	—	—	—	—	—	0.1	X
Xylidine	1300-73-8	2.0	10	—	—	—	—	X
Yttrium	7440-65-5	—	1.0	—	—	—	—	—
Zinc chloride fume	7646-85-7	—	1.0	—	2.0	—	—	—
Zinc chromate (as CrO3)	Varies with com- pound	—	0.05	—	—	—	0.1	—
Zinc oxide	1314-13-2	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Zinc oxide fume	1314-13-2	—	5.0	—	10	—	—	—

Substance	CAS ^h Number	TWA		STEL ^c		CEILING		Skin Designation
		ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	ppm ^a	mg/m ^{3b}	
Zinc stearate	557-05-1	—	—	—	—	—	—	—
Total dust	—	—	10	—	—	—	—	—
Respirable fraction	—	—	5.0 ^k	—	—	—	—	—
Zirconium compounds (as Zr)	7440-67-2	—	5.0	—	10	—	—	—

- Notes:
- a Parts of vapor or gas per million parts of contaminated air by volume at 25 degrees C and 760 mm Hg pressure (torr).
 - b Milligrams of substance per cubic meter of air. When a numerical entry for a substance is in the mg/m³ column and not in the ppm column, then the number in the mg/m³ column is exact. When numerical entries for a substance are in both the ppm and mg/m³ columns, then the number in the ppm column is exact and the number in the mg/m³ column may be rounded off.
 - c Duration is for 15 minutes, unless otherwise noted.
 - d The final benzene standard in WAC 296-62-07523 applies to all occupational exposures to benzene except some sub-segments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures).
 - e This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time-weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and garretting. See also WAC 296-62-14533 for cotton dust limits applicable to other sectors.
 - f As determined from breathing-zone air samples.
 - g Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
1	97
2	91
3	74
4	50
5	30
6	17
7	9
8	5
10	1

- h The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound measured as the metal, the CAS number for the metal is given — not CAS numbers for the individual compounds.
- i Compliance with the subtilisins PEL is assessed by sampling with a high volume sampler (600-800 liters per minute) for at least 60 minutes.
- j Sampling for the carbon monoxide ceiling shall be averaged over 5 minutes but an instantaneous reading over 1500 ppm shall not be exceeded.
- k The concentration of respirable particulate for the application of this limit is determined from the fraction passing a size-selector with the following characteristics.

Aerodynamic diameter (unit density sphere)	Percent passing selector
1	97
2	91
3	74
4	50
5	30
6	17
7	9
8	5
10	1

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050, and 49.26.130. 00-06-075, § 296-62-07515, filed 3/1/00, effective 4/10/00. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 98-10-029, § 296-62-07515, filed 4/24/98, effective 7/24/98; 97-19-014, § 296-62-07515, filed 9/5/97, effective 11/5/97. Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-62-07515, filed 8/20/96, effective 10/15/96; 93-01-067 (Order 92-15), § 296-62-07515, filed 12/11/92, effective 1/15/93; 91-11-070 (Order 91-01), § 296-62-07515, filed 5/20/91, effective 6/20/91; 90-03-029 (Order 89-20), § 296-62-07515, filed 1/11/90, effective 2/26/90; 89-15-002 (Order 89-06), § 296-62-07515, filed 7/6/89, effective 8/7/89; 88-14-108 (Order 88-11), § 296-62-07515, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-07515, filed 11/30/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-07515, filed 7/25/86; 85-01-022 (Order 84-24), § 296-62-07515, filed 12/11/84; 82-13-045 (Order 82-22), § 296-62-07515, filed 6/11/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-015 (Order 81-20), § 296-62-07515, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-07515, filed 8/8/80. Statutory Authority: RCW 49.17.040, 49.17.150 and 49.17.240. 79-08-115 (Order 79-9), § 296-62-07515, filed 7/31/79; Order 73-3, § 296-62-07515, filed 5/7/73.]

PART I—AIR CONTAMINANTS (SPECIFIC)

WAC 296-62-07517 Reserved.

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-62-07517, filed 4/10/90, effective 5/25/90; 87-24-051 (Order 87-24), § 296-62-07517, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07517, filed 4/27/87. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-07517, filed 8/27/81; 81-16-015 (Order 81-20), § 296-62-07517, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-07517, filed 8/8/80; Order 77-12, § 296-62-07517, filed 7/11/77; Order 73-3, § 296-62-07517, filed 5/7/73.]

WAC 296-62-07519 Thiram. (1) Scope and application. This section applies to occupational exposure to thiram (tetramethylthiuram disulfide), in addition to those requirements listed in WAC 296-62-07515. Nothing in this section shall preclude the application of other appropriate standards and regulations to minimize worker exposure to thiram.

(2) Definitions. The following definitions are applicable to this section:

(a) Clean - the absence of dirt or materials which may be harmful to a worker's health.

(b) Large seedlings - those seedlings of such size, either by length or breadth, that it is difficult to avoid contact of the thiram treated plant with the mouth or face during planting operations.

(3) General requirements.

(a) Workers should not be allowed to work more than five days in any seven day period with or around the application of thiram or thiram treated seedlings.

(b) Washing and worker hygiene.

(i) Workers shall wash their hands prior to eating or smoking at the close of work.

(ii) Warm (at least 85°F, 29.4°C) wash water and single use hand wiping materials shall be provided for washing.

(iii) The warm water and hand wiping materials shall be at fixed work locations or at the planting unit.

(iv) Where warm water is not available within 15 minutes travel time, nonalcoholic based waterless hand cleaner shall be provided.

(v) Every planter or nursery worker shall be advised to bathe or shower daily.

(vi) The inside of worker carrying vehicles shall be washed or vacuumed and wiped down at least weekly during the period of thiram use.

(c) Personal protective measures.

(i) Clothing shall be worn by workers to reduce skin contact with thiram to the legs, arms and torso.

(ii) For those workers who have thiram skin irritations, exposed areas of the body shall be protected by a suitable barrier cream.

(iii) Clothing worn by workers shall be washed or changed at least every other day.

(iv) Only impervious gloves may be worn by workers.

(v) Workers hands should be clean of thiram before placing them into gloves.

(vi) Thiram applicators shall be provided with and use respiratory protection in accordance with WAC 296-62-071, disposable coveralls or rubber slickers or other impervious clothing, rubberized boots, head covers and rubberized gloves.

(vii) Nursery workers, other than applicators, who are likely to be exposed to thiram shall be provided with and use disposable coveralls or rubber slickers or other impervious clothing, impervious footwear and gloves, and head covers in accordance with WAC 296-24-075, unless showers have been provided and are used.

(viii) Eye protection according to WAC 296-24-078, shall be provided and worn by workers who may be exposed to splashes of thiram during spraying, plug bundling, belt line grading and plugging or other operations.

(ix) Item (viii) of this subdivision need not be complied with where pressurized emergency eye wash fountains are within 10 seconds travel time of the work location. (Approved respirator - see WAC 296-62-071.)

(x) A dust mask shall be worn, when planting large seedlings, to avoid mouth and face contact with the thiram treated plant unless equally effective measures or planting practices have been established.

(d) Food handling.

(i) Food snacks, beverages, smoking materials, or any other item which is consumed shall not be stored or consumed in the packing area of the nursery.

(ii) Worker carrying vehicles shall have a clean area for carrying lunches.

(iii) The clean area of the vehicle shall be elevated from the floor and not used to carry other than food or other consumable items.

(iv) The carrying of lunches, food or other consumable items in tree planting bags is prohibited.

(v) Care shall be taken to insure that worker exposure to thiram spray, including downwind driftings, is minimized or eliminated.

(vi) When bags that contained thiram or thiram treated seedlings are burned, prevent worker exposure to the smoke.

(e) Thiram use and handling.

(i) Thiram treated seedlings shall be allowed to dry or stabilize prior to packing.

(ii) Seedlings shall be kept moist during packing and whenever possible during planting operations.

(iii) Floors, where thiram is used, shall not be dry swept but instead vacuumed, washed or otherwise cleaned at least daily.

(iv) Silica chips used to cover thiram treated seedling plugs shall be removed at the nursery.

(f) Training.

(i) Each worker engaged in operations where exposure to thiram may occur shall be provided training on the hazards of thiram, as well as the necessary precautions for its safe use and handling.

(ii) The training shall include instruction in:

(A) The nature of the health hazard(s) from exposure to thiram including specifically the potential for alcohol intolerance, drug interaction, and skin irritation;

(B) The specific nature of operations which could result in exposure to thiram and the necessary protective steps;

(C) The purpose for, proper use, and limitations of protective devices including respirators and clothing;

(D) The necessity for and requirements of good personal hygiene; and

(E) A review of the thiram rules at the worker's first training and indoctrination, and annually thereafter.

(4) Effective date. This standard shall become effective 30 days after being filed with the code reviser.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-16-016 (Order 81-19), § 296-62-07519, filed 7/27/81.]

WAC 296-62-07521 Lead. (1) Scope and application.

(a) This section applies to all occupational exposure to lead, except as provided in subdivision (1)(b).

(b) This section does not apply to the construction industry or to agricultural operations covered by chapter 296-306 WAC.

(2) Definitions as applicable to this part.

(a) "Action level" - employee exposure, without regard to the use of respirators, to an airborne concentration of lead of thirty micrograms per cubic meter of air ($30 \mu\text{g}/\text{m}^3$) averaged over an eight-hour period.

(b) "Director" - the director of the department of labor and industries.

(c) "Lead" - metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

(3) General requirements.

(a) Employers will assess the hazards of lead in the work place and provide information to the employees about the hazards of the lead exposures to which they may be exposed.

(b) Information provided shall include:

(i) Exposure monitoring (including employee notification);

(ii) Written compliance programs;

(iii) Respiratory protection programs;

(iv) Personnel protective equipment and housekeeping;

(v) Medical surveillance and examinations;

(vi) Training requirements;

(vii) Recordkeeping requirements.

(4) Permissible exposure limit (PEL).

(a) The employer shall assure that no employee is exposed to lead at concentrations greater than fifty micrograms per cubic meter of air ($50 \mu\text{g}/\text{m}^3$) averaged over an eight-hour period.

(b) If an employee is exposed to lead for more than eight hours in any work day, the permissible exposure limit, as a time weighted average (TWA) for that day, shall be reduced according to the following formula:

$$\text{Maximum permissible limit (in } \mu\text{g}/\text{m}^3) = 400 \div \text{hours worked in the day.}$$

(c) When respirators are used to supplement engineering and work practice controls to comply with the PEL and all the requirements of subsection (7) have been met, employee exposure, for the purpose of determining whether the employer has complied with the PEL, may be considered to be at the level provided by the protection factor of the respirator for those periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

(5) Exposure monitoring.

(a) General.

(i) For the purposes of subsection (5), employee exposure is that exposure which would occur if the employee were not using a respirator.

(ii) With the exception of monitoring under subdivision (5)(c), the employer shall collect full shift (for at least seven continuous hours) personal samples including at least one sample for each shift for each job classification in each work area.

(iii) Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.

(b) Initial determination. Each employer who has a workplace or work operation covered by this standard shall determine if any employee may be exposed to lead at or above the action level.

(c) Basis of initial determination.

(i) The employer shall monitor employee exposures and shall base initial determinations on the employee exposure monitoring results and any of the following, relevant considerations:

(A) Any information, observations, or calculations which would indicate employee exposure to lead;

(B) Any previous measurements of airborne lead; and

(C) Any employee complaints of symptoms which may be attributable to exposure to lead.

(ii) Monitoring for the initial determination may be limited to a representative sample of the exposed employees who the employer reasonably believes are exposed to the greatest airborne concentrations of lead in the workplace.

(iii) Measurements of airborne lead made in the preceding twelve months may be used to satisfy the requirement to monitor under item (5)(c)(i) if the sampling and analytical methods used meet the accuracy and confidence levels of subdivision (5)(i) of this section.

(d) Positive initial determination and initial monitoring.

(i) Where a determination conducted under subdivision (5)(b) and (5)(c) of this section shows the possibility of any employee exposure at or above the action level, the employer shall conduct monitoring which is representative of the exposure for each employee in the workplace who is exposed to lead.

(ii) Measurements of airborne lead made in the preceding twelve months may be used to satisfy this requirement if the sampling and analytical methods used meet the accuracy and confidence levels of subdivision (5)(i) of this section.

(e) Negative initial determination. Where a determination, conducted under subdivisions (5)(b) and (5)(c) of this section is made that no employee is exposed to airborne concentrations of lead at or above the action level, the employer shall make a written record of such determination. The record shall include at least the information specified in subdivision (5)(c) of this section and shall also include the date of determination, location within the worksite, and the name and social security number of each employee monitored.

(f) Frequency.

(i) If the initial monitoring reveals employee exposure to be below the action level the measurements need not be repeated except as otherwise provided in subdivision (5)(g) of this section.

(ii) If the initial determination or subsequent monitoring reveals employee exposure to be at or above the action level but below the permissible exposure limit the employer shall repeat monitoring in accordance with this subsection at least every six months. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least seven days apart, are below the action level at which time the employer may discontinue monitoring for that employee except as otherwise provided in subdivision (5)(g) of this section.

(iii) If the initial monitoring reveals that employee exposure is above the permissible exposure limit the employer shall repeat monitoring quarterly. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least seven days apart, are below the PEL but at or above the action level at which time the employer shall repeat monitoring for that employee at the frequency specified in item (5)(f)(ii), except as otherwise provided in subdivision (5)(g) of this section.

(g) Additional monitoring. Whenever there has been a production, process, control or personnel change which may result in new or additional exposure to lead, or whenever the employer has any other reason to suspect a change which may result in new or additional exposures to lead, additional monitoring in accordance with this subsection shall be conducted.

(h) Employee notification.

(i) Within five working days after the receipt of monitoring results, the employer shall notify each employee in writing of the results which represent that employee's exposure.

(ii) Whenever the results indicate that the representative employee exposure, without regard to respirators, exceeds the permissible exposure limit, the employer shall include in the written notice a statement that the permissible exposure limit was exceeded and a description of the corrective action

taken or to be taken to reduce exposure to or below the permissible exposure limit.

(i) Accuracy of measurement. The employer shall use a method of monitoring and analysis which has an accuracy (to a confidence level of ninety-five percent) of not less than plus or minus twenty percent for airborne concentrations of lead equal to or greater than 30 µg/m³.

(6) Methods of compliance.

(a) Engineering and work practice controls.

(i) Where any employee is exposed to lead above the permissible exposure limit for more than thirty days per year, the employer shall implement engineering and work practice controls (including administrative controls) to reduce and maintain employee exposure to lead in accordance with the implementation schedule in Table I below, except to the extent that the employer can demonstrate that such controls are not feasible. Wherever the engineering and work practice controls which can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest feasible level and shall supplement them by the use of respiratory protection which complies with the requirements of subsection (7) of this section.

(ii) Where any employee is exposed to lead above the permissible exposure limit, but for thirty days or less per year, the employer shall implement engineering controls to reduce exposures to 200 µg/m³, but thereafter may implement any combination of engineering, work practice (including administrative controls), and respiratory controls to reduce and maintain employee exposure to lead to or below 50 µg/m³.

TABLE I

Industry	Compliance dates: ¹ (50 µg/m ³)
Lead chemicals, secondary copper smelting.	July 19, 1996
Nonferrous foundries	July 19, 1996. ²
Brass and bronze ingot manufacture.	6 years. ³

¹ Calculated by counting from the date the stay on implementation of subsection (6)(a) was lifted by the U.S. Court of Appeals for the District of Columbia, the number of years specified in the 1978 lead standard and subsequent amendments for compliance with the PEL of 50 µg/m³ for exposure to airborne concentrations of lead levels for the particular industry.

² Large nonferrous foundries (20 or more employees) are required to achieve the PEL of 50 µg/m³ by means of engineering and work practice controls. Small nonferrous foundries (fewer than 20 employees) are required to achieve an 8-hour TWA of 75 µg/m³ by such controls.

³ Expressed as the number of years from the date on which the Court lifts the stay on the implementation of subsection (6)(a) for this industry for employers to achieve a lead in air concentration of 75 µg/m³. Compliance with subsection (6) in this industry is determined by a compliance directive that incorporates elements from the settlement agreement between OSHA and representatives of the industry.

(b) Respiratory protection. Where engineering and work practice controls do not reduce employee exposure to or below the 50 µg/m³ permissible exposure limit, the employer shall supplement these controls with respirators in accordance with subsection (7).

(c) Compliance program.

(i) Each employer shall establish and implement a written compliance program to reduce exposures to or below the

permissible exposure limit, and interim levels if applicable, solely by means of engineering and work practice controls in accordance with the implementation schedule in subdivision (6)(a).

(ii) Written plans for these compliance programs shall include at least the following:

(A) A description of each operation in which lead is emitted; e.g., machinery used, material processed, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices;

(B) A description of the specific means that will be employed to achieve compliance, including engineering plans and studies used to determine methods selected for controlling exposure to lead;

(C) A report of the technology considered in meeting the permissible exposure limit;

(D) Air monitoring data which documents the source of lead emissions;

(E) A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.;

(F) A work practice program which includes items required under subsections (8), (9) and (10) of this regulation;

(G) An administrative control schedule required by subdivision (6)(f), if applicable; and

(H) Other relevant information.

(iii) Written programs shall be submitted upon request to the director, and shall be available at the worksite for examination and copying by the director, any affected employee or authorized employee representatives.

(iv) Written programs shall be revised and updated at least every six months to reflect the current status of the program.

(d) Mechanical ventilation.

(i) When ventilation is used to control exposure, measurements which demonstrate the effectiveness of the system in controlling exposure, such as capture velocity, duct velocity, or static pressure shall be made at least every three months. Measurements of the system's effectiveness in controlling exposure shall be made within five days of any change in production, process, or control which might result in a change in employee exposure to lead.

(ii) Recirculation of air. If air from exhaust ventilation is recirculated into the workplace, the employer shall assure that (A) the system has a high efficiency filter with reliable back-up filter; and (B) controls to monitor the concentration of lead in the return air and to bypass the recirculation system automatically if it fails are installed, operating, and maintained.

(e) Administrative controls. If administrative controls are used as a means of reducing employees TWA exposure to lead, the employer shall establish and implement a job rotation schedule which includes:

(i) Name or identification number of each affected employee;

(ii) Duration and exposure levels at each job or work station where each affected employee is located; and

(iii) Any other information which may be useful in assessing the reliability of administrative controls to reduce exposure to lead.

(7) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

- (i) Period necessary to install or implement engineering or work-practice controls;
- (ii) Work operations for which engineering and work-practice controls are not sufficient to reduce exposures to or below the permissible exposure limit;
- (iii) Periods when an employee requests a respirator.

(b) Respirator program.

(i) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(ii) If an employee has breathing difficulty during fit testing or respirator use, the employer must provide the employee with a medical examination as required by subsection (11)(c)(ii)(C) of this section to determine whether or not the employee can use a respirator while performing the required duty.

(c) Respirator selection.

(i) The employer must select the appropriate respirator or combination of respirators from Table II of this section.

(ii) The employer must provide a powered air-purifying respirator instead of the respirator specified in Table II of this section when an employee chooses to use this type of respirator and that such a respirator provides adequate protection to the employee.

Airborne Concentration of Lead or Condition of Use	Required Respirator ¹
Not in excess of 0.5 mg/m ³ (10X PEL).	Half-mask, air-purifying respirator equipped with high efficiency filters. ^{2,3}
Not in excess of 2.5 mg/m ³ (50X PEL).	Full facepiece, air-purifying respirator with high efficiency filters. ³
Not in excess of 50 mg/m ³ (1000X PEL).	(1) Any powered, air-purifying respirator with high efficiency filters ³ ; or (2) Half-mask supplied-air respirator operated in positive-pressure mode. ²
Not in excess of 100 mg/m ³ (2000X PEL).	Supplied-air respirators with full facepiece, hood, helmet, or suit, operated in positive pressure mode.
Greater than 100 mg/m ³ , unknown concentration or fire fighting.	Full facepiece, self-contained breathing apparatus operated in positive-pressure mode.

Note: ¹ Respirators specified for high concentrations can be used at lower concentrations of lead.

² Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

³ A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

(8) Protective work clothing and equipment.

(a) Provision and use. If an employee is exposed to lead above the PEL, without regard to the use of respirators or where the possibility of skin or eye irritation exists, the employer shall provide at no cost to the employee and assure

that the employee uses appropriate protective work clothing and equipment such as, but not limited to:

- (i) Coveralls or similar full-body work clothing;
- (ii) Gloves, hats, and shoes or disposable shoe coverlets; and
- (iii) Face shields, vented goggles, or other appropriate protective equipment which complies with WAC 296-24-078.

(b) Cleaning and replacement.

(i) The employer shall provide the protective clothing required in subdivision (8)(a) of this section in a clean and dry condition at least weekly, and daily to employees whose exposure levels without regard to a respirator are over 200 µg/m³ of lead as an eight-hour TWA.

(ii) The employer shall provide for the cleaning, laundering, or disposal of protective clothing and equipment required by subdivision (8)(a) of this section.

(iii) The employer shall repair or replace required protective clothing and equipment as needed to maintain their effectiveness.

(iv) The employer shall assure that all protective clothing is removed at the completion of a work shift only in change rooms provided for that purpose as prescribed in subdivision (10)(b) of this section.

(v) The employer shall assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change-room which prevents dispersion of lead outside the container.

(vi) The employer shall inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.

(vii) The employer shall assure that the containers of contaminated protective clothing and equipment required by subdivision (8)(b)(v) are labeled as follows:

CAUTION: CLOTHING CONTAMINATED WITH LEAD.
DO NOT REMOVE DUST BY BLOWING OR SHAKING.
DISPOSE OF LEAD CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, OR FEDERAL REGULATIONS.

(viii) The employer shall prohibit the removal of lead from protective clothing or equipment by blowing, shaking, or any other means which disperses lead into the air.

(9) Housekeeping.

(a) Surfaces. All surfaces shall be maintained as free as practicable of accumulations of lead.

(b) Cleaning floors.

(i) Floors and other surfaces where lead accumulates may not be cleaned by the use of compressed air.

(ii) Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and found not to be effective.

(c) Vacuuming. Where vacuuming methods are selected, the vacuums shall be used and emptied in a manner which minimizes the reentry of lead into the workplace.

(10) Hygiene facilities and practices.

(a) The employer shall assure that in areas where employees are exposed to lead above the PEL, without regard to the use of respirators, food or beverage is not present or consumed, tobacco products are not present or used, and cos-

metics are not applied, except in change rooms, lunchrooms, and showers required under subdivision (10)(b) through (10)(d) of this section.

(b) Change rooms.

(i) The employer shall provide clean change rooms for employees who work in areas where their airborne exposure to lead is above the PEL, without regard to the use of respirators.

(ii) The employer shall assure that change rooms are equipped with separate storage facilities for protective work clothing and equipment and for street clothes which prevent cross-contamination.

(c) Showers.

(i) The employer shall assure that employees who work in areas where their airborne exposure to lead is above the PEL, without regard to the use of respirators, shower at the end of the work shift.

(ii) The employer shall provide shower facilities in accordance with WAC 296-24-12009.

(iii) The employer shall assure that employees who are required to shower pursuant to item (10)(c)(i) do not leave the workplace wearing any clothing or equipment worn during the work shift.

(d) Lunchrooms.

(i) The employer shall provide lunchroom facilities for employees who work in areas where their airborne exposure to lead is above the PEL, without regard to the use of respirators.

(ii) The employer shall assure that lunchroom facilities have a temperature controlled, positive pressure, filtered air supply, and are readily accessible to employees.

(iii) The employer shall assure that employees who work in areas where their airborne exposure to lead is above the PEL without regard to the use of a respirator wash their hands and face prior to eating, drinking, smoking or applying cosmetics.

(iv) The employer shall assure that employees do not enter lunchroom facilities with protective work clothing or equipment unless surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method.

(e) Lavatories. The employer shall provide an adequate number of lavatory facilities which comply with WAC 296-24-12009 (1) and (2).

(11) Medical surveillance.

(a) General.

(i) The employer shall institute a medical surveillance program for all employees who are or may be exposed above the action level for more than thirty days per year.

(ii) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician.

(iii) The employer shall provide the required medical surveillance including multiple physician review under item (11)(c)(iii) without cost to employees and at a reasonable time and place.

(b) Biological monitoring.

(i) Blood lead and ZPP level sampling and analysis. The employer shall make available biological monitoring in the form of blood sampling and analysis for lead and zinc proto-

porphyrin levels to each employee covered under item (11)(a)(i) of this section on the following schedule:

(A) At least every six months to each employee covered under item (11)(a)(i) of this section;

(B) At least every two months for each employee whose last blood sampling and analysis indicated a blood lead level at or above 40 $\mu\text{g}/100\text{ g}$ of whole blood. This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 $\mu\text{g}/100\text{ g}$ of whole blood; and

(C) At least monthly during the removal period of each employee removed from exposure to lead due to an elevated blood lead level.

(ii) Follow-up blood sampling tests. Whenever the results of a blood lead level test indicate that an employee's blood lead level exceeds the numerical criterion for medical removal under item (12)(a)(i)(A), the employer shall provide a second (follow-up) blood sampling test within two weeks after the employer receives the results of the first blood sampling test.

(iii) Accuracy of blood lead level sampling and analysis. Blood lead level sampling and analysis provided pursuant to this section shall have an accuracy (to a confidence level of ninety-five percent) within plus or minus fifteen percent or 6 $\mu\text{g}/100\text{ ml}$, whichever is greater, and shall be conducted by a laboratory licensed by the Center for Disease Control (CDC), United States Department of Health, Education and Welfare or which has received a satisfactory grade in blood lead proficiency testing from CDC in the prior twelve months.

(iv) Employee notification. Within five working days after the receipt of biological monitoring results, the employer shall notify in writing each employee whose blood lead level exceeds 40 $\mu\text{g}/100\text{ g}$: (A) of that employee's blood lead level and (B) that the standard requires temporary medical removal with medical removal protection benefits when an employee's blood lead level exceeds the numerical criterion for medical removal under item (12)(a)(i) of this section.

(c) Medical examinations and consultations.

(i) Frequency. The employer shall make available medical examinations and consultations to each employee covered under item (11)(a)(i) of this section on the following schedule:

(A) At least annually for each employee for whom a blood sampling test conducted at any time during the preceding twelve months indicated a blood lead level at or above 40 $\mu\text{g}/100\text{ g}$;

(B) Prior to assignment for each employee being assigned for the first time to an area in which airborne concentrations of lead are at or above the action level;

(C) As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice concerning the effects of current or past exposure to lead on the employee's ability to procreate a healthy child, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during use; and

(D) As medically appropriate for each employee either removed from exposure to lead due to a risk of sustaining

material impairment to health, or otherwise limited pursuant to a final medical determination.

(ii) Content. Medical examinations made available pursuant to subitems (11)(c)(i)(A) through (B) of this section shall include the following elements:

(A) A detailed work history and a medical history, with particular attention to past lead exposure (occupational and nonoccupational), personal habits (smoking, hygiene), and past gastrointestinal, hematologic, renal, cardiovascular, reproductive and neurological problems;

(B) A thorough physical examination, with particular attention to teeth, gums, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems. Pulmonary status should be evaluated if respiratory protection will be used;

(C) A blood pressure measurement;

(D) A blood sample and analysis which determines:

(I) Blood lead level;

(II) Hemoglobin and hematocrit determinations, red cell indices, and examination of peripheral smear morphology;

(III) Zinc protoporphyrin;

(IV) Blood urea nitrogen; and

(V) Serum creatinine;

(E) A routine urinalysis with microscopic examination; and

(F) Any laboratory or other test which the examining physician deems necessary by sound medical practice.

The content of medical examinations made available pursuant to subitems (11)(c)(i)(C) through (D) of this section shall be determined by an examining physician and, if requested by an employee, shall include pregnancy testing or laboratory evaluation of male fertility.

(iii) Multiple physician review mechanism.

(A) If the employer selects the initial physician who conducts any medical examination or consultation provided to an employee under this section, the employee may designate a second physician:

(I) To review any findings, determinations or recommendations of the initial physician; and

(II) To conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.

(B) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation pursuant to this section. The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen days after receipt of the foregoing notification, or receipt of the initial physician's written opinion, whichever is later:

(I) The employee informing the employer that he or she intends to seek a second medical opinion, and

(II) The employee initiating steps to make an appointment with a second physician.

(C) If the findings, determinations or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve any disagreement.

(D) If the two physicians have been unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician:

(I) To review any findings, determinations or recommendations of the prior physicians; and

(II) To conduct such examinations, consultations, laboratory tests and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

(E) The employer shall act consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(iv) Information provided to examining and consulting physicians.

(A) The employer shall provide an initial physician conducting a medical examination or consultation under this section with the following information:

(I) A copy of this regulation for lead including all appendices;

(II) A description of the affected employee's duties as they relate to the employee's exposure;

(III) The employee's exposure level or anticipated exposure level to lead and to any other toxic substance (if applicable);

(IV) A description of any personal protective equipment used or to be used;

(V) Prior blood lead determinations; and

(VI) All prior written medical opinions concerning the employee in the employer's possession or control.

(B) The employer shall provide the foregoing information to a second or third physician conducting a medical examination or consultation under this section upon request either by the second or third physician, or by the employee.

(v) Written medical opinions.

(A) The employer shall obtain and furnish the employee with a copy of a written medical opinion from each examining or consulting physician which contains the following information:

(I) The physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead;

(II) Any recommended special protective measures to be provided to the employee, or limitations to be placed upon the employee's exposure to lead;

(III) Any recommended limitation upon the employee's use of respirators, including a determination of whether the employee can wear a powered air purifying respirator if a physician determines that the employee cannot wear a negative pressure respirator; and

(IV) The results of the blood lead determinations.

(B) The employer shall instruct each examining and consulting physician to:

(I) Not reveal either in the written opinion, or in any other means of communication with the employer, findings, including laboratory results, or diagnoses unrelated to an employee's occupational exposure to lead; and

(II) Advise the employee of any medical condition, occupational or nonoccupational, which dictates further medical examination or treatment.

(vi) Alternate physician determination mechanisms. The employer and an employee or authorized employee representative may agree upon the use of any expeditious alternate physician determination mechanism in lieu of the multiple physician review mechanism provided by this subsection so long as the alternate mechanism otherwise satisfies the requirements contained in this subsection.

(d) Chelation.

(i) The employer shall assure that any person whom he retains, employs, supervises or controls does not engage in prophylactic chelation of any employee at any time.

(ii) If therapeutic or diagnostic chelation is to be performed by any person in item (11)(d)(i), the employer shall assure that it be done under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring and that the employee is notified in writing prior to its occurrence.

(12) Medical removal protection.

(a) Temporary medical removal and return of an employee.

(i) Temporary removal due to elevated blood lead levels.

(A) The employer shall remove an employee from work having an exposure to lead at or above the action level on each occasion that a periodic and a follow-up blood sampling test conducted pursuant to this section indicate that the employee's blood lead level is at or above 60 $\mu\text{g}/100\text{ g}$ of whole blood; and

(B) The employer shall remove an employee from work having an exposure to lead at or above the action level on each occasion that the average of the last three blood sampling tests conducted pursuant to this section (or the average of all blood sampling tests conducted over the previous six months, whichever is longer) indicates that the employee's blood lead level is at or above 50 $\mu\text{g}/100\text{ g}$ of whole blood; provided, however, that an employee need not be removed if the last blood sampling test indicates a blood lead level at or below 40 $\mu\text{g}/100\text{ g}$ of whole blood.

(ii) Temporary removal due to a final medical determination.

(A) The employer shall remove an employee from work having an exposure to lead at or above the action level on each occasion that a final medical determination results in a medical finding, determination, or opinion that the employee has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

(B) For the purposes of this section, the phrase "final medical determination" shall mean the outcome of the multiple physician review mechanism or alternate medical determination mechanism used pursuant to the medical surveillance provisions of this section.

(C) Where a final medical determination results in any recommended special protective measures for an employee, or limitations on an employee's exposure to lead, the employer shall implement and act consistent with the recommendation.

(iii) Return of the employee to former job status.

(A) The employer shall return an employee to his or her former job status:

(I) For an employee removed due to a blood lead level at or above 60 $\mu\text{g}/100\text{ g}$, or due to an average blood lead level at or above 50 $\mu\text{g}/100\text{ g}$, when two consecutive blood sampling tests indicate that the employee's blood lead level is at or below 40 $\mu\text{g}/100\text{ g}$ of whole blood;

(II) For an employee removed due to a final medical determination, when a subsequent final medical determination results in a medical finding, determination, or opinion that the employee no longer has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

(B) For the purposes of this section, the requirement that an employer return an employee to his or her former job status is not intended to expand upon or restrict any rights an employee has or would have had, absent temporary medical removal, to a specific job classification or position under the terms of a collective bargaining agreement.

(iv) Removal of other employee special protective measure or limitations. The employer shall remove any limitations placed on an employee or end any special protective measures provided to an employee pursuant to a final medical determination when a subsequent final medical determination indicates that the limitations or special protective measures are no longer necessary.

(v) Employer options pending a final medical determination. Where the multiple physician review mechanism, or alternate medical determination mechanism used pursuant to the medical surveillance provisions of this section, has not yet resulted in a final medical determination with respect to an employee, the employer shall act as follows:

(A) Removal. The employer may remove the employee from exposure to lead, provide special protective measures to the employee, or place limitations upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status.

(B) Return. The employer may return the employee to his or her former job status, end any special protective measures provided to the employee, and remove any limitations placed upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status, with two exceptions. If:

(I) The initial removal, special protection, or limitation of the employee resulted from a final medical determination which differed from the findings, determinations, or recommendations of the initial physician; or

(II) The employee has been on removal status for the preceding eighteen months due to an elevated blood lead level, then the employer shall await a final medical determination.

(b) Medical removal protection benefits.

(i) Provision of medical removal protection benefits. The employer shall provide to an employee up to eighteen months of medical removal protection benefits on each occasion that an employee is removed from exposure to lead or otherwise limited pursuant to this section.

(ii) Definition of medical removal protection benefits. For the purposes of this section, the requirement that an employer provide medical removal protection benefits means that the employer shall maintain the earnings, seniority and other employment rights and benefits of an employee as though the employee had not been removed from normal exposure to lead or otherwise limited.

(iii) Follow-up medical surveillance during the period of employee removal or limitation. During the period of time that an employee is removed from normal exposure to lead or otherwise limited, the employer may condition the provision of medical removal protection benefits upon the employee's participation in follow-up medical surveillance made available pursuant to this section.

(iv) Workers' compensation claims. If a removed employee files a claim for workers' compensation payments for a lead-related disability, then the employer shall continue to provide medical removal protection benefits pending disposition of the claim. To the extent that an award is made to the employee for earnings lost during the period of removal, the employer's medical removal protection obligation shall be reduced by such amount. The employer shall receive no credit for workers' compensation payments received by the employee for treatment related expenses.

(v) Other credits. The employer's obligation to provide medical removal protection benefits to a removed employee shall be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program, or receives income from employment with another employer made possible by virtue of the employee's removal.

(vi) Employees whose blood lead levels do not adequately decline within eighteen months of removal. The employer shall take the following measures with respect to any employee removed from exposure to lead due to an elevated blood lead level whose blood lead level has not declined within the past eighteen months of removal so that the employee has been returned to his or her former job status:

(A) The employer shall make available to the employee a medical examination pursuant to this section to obtain a final medical determination with respect to the employee;

(B) The employer shall assure that the final medical determination obtained indicates whether or not the employee may be returned to his or her former job status, and if not, what steps should be taken to protect the employee's health;

(C) Where the final medical determination has not yet been obtained, or once obtained indicates that the employee may not yet be returned to his or her former job status, the employer shall continue to provide medical removal protection benefits to the employee until either the employee is returned to former job status, or a final medical determination is made that the employee is incapable of ever safely returning to his or her former job status.

(D) Where the employer acts pursuant to a final medical determination which permits the return of the employee to his or her former job status despite what would otherwise be an unacceptable blood lead level, later questions concerning removing the employee again shall be decided by a final

medical determination. The employer need not automatically remove such an employee pursuant to the blood lead level removal criteria provided by this section.

(vii) Voluntary removal or restriction of an employee. Where an employer, although not required by this section to do so, removes an employee from exposure to lead or otherwise places limitations on an employee due to the effects of lead exposure on the employee's medical condition, the employer shall provide medical removal protection benefits to the employee equal to that required by item (12)(b)(i) of this section.

(13) Employee information and training.

(a) Training program.

(i) Each employer who has a workplace in which there is a potential exposure to airborne lead at any level shall inform employees of the content of Appendices A and B of this regulation.

(ii) The employer shall institute a training program for and assure the participation of all employees who are subject to exposure to lead at or above the action level or for whom the possibility of skin or eye irritation exists.

(iii) The employer shall provide initial training by one hundred eighty days from the effective date for those employees covered by item (13)(a)(ii) on the standard's effective date and prior to the time of initial job assignment for those employees subsequently covered by this subsection.

(iv) The training program shall be repeated at least annually for each employee.

(v) The employer shall assure that each employee is informed of the following:

(A) The content of this standard and its appendices;

(B) The specific nature of the operations which could result in exposure to lead above the action level;

(C) The purpose, proper use, limitations, and other training requirements for respiratory protection as required by chapter 296-62 WAC, Part E;

(D) The purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females);

(E) The engineering controls and work practices associated with the employee's job assignment;

(F) The contents of any compliance plan in effect; and

(G) Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician.

(b) Access to information and training materials.

(i) The employer shall make readily available to all affected employees a copy of this standard and its appendices.

(ii) The employer shall provide, upon request, all materials relating to the employee information and training program to the director.

(iii) In addition to the information required by item (13)(a)(v), the employer shall include as part of the training program, and shall distribute to employees, any materials pertaining to the Occupational Safety and Health Act, the

regulations issued pursuant to the act, and this lead standard, which are made available to the employer by the director.

(14) Signs.

(a) General.

(i) The employer may use signs required by other statutes, regulations or ordinances in addition to, or in combination with, signs required by this subsection.

(ii) The employer shall assure that no statement appears on or near any sign required by this subsection which contradicts or detracts from the meaning of the required sign.

(b) Signs.

(i) The employer shall post the following warning signs in each work area where the PEL is exceeded:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

(ii) The employer shall assure that signs required by this subsection are illuminated and cleaned as necessary so that the legend is readily visible.

(15) Recordkeeping.

(a) Exposure monitoring.

(i) The employer shall establish and maintain an accurate record of all monitoring required in subsection (5) of this section.

(ii) This record shall include:

(A) The date(s), number, duration, location and results of each of the samples taken, including a description of the sampling procedure used to determine representative employee exposure where applicable;

(B) A description of the sampling and analytical methods used and evidence of their accuracy;

(C) The type of respiratory protective devices worn, if any;

(D) Name, social security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent; and

(E) The environmental variables that could affect the measurement of employee exposure.

(iii) The employer shall maintain these monitoring records for at least forty years or for the duration of employment plus twenty years, whichever is longer.

(b) Medical surveillance.

(i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance as required by subsection (11) of this section.

(ii) This record shall include:

(A) The name, social security number, and description of the duties of the employee;

(B) A copy of the physician's written opinions;

(C) Results of any airborne exposure monitoring done for that employee and the representative exposure levels supplied to the physician; and

(D) Any employee medical complaints related to exposure to lead.

(iii) The employer shall keep, or assure that the examining physician keeps, the following medical records:

(A) A copy of the medical examination results including medical and work history required under subsection (11) of this section;

(B) A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information; and

(C) A copy of the results of biological monitoring.

(iv) The employer shall maintain or assure that the physician maintains those medical records for at least forty years, or for the duration of employment plus twenty years, whichever is longer.

(c) Medical removals.

(i) The employer shall establish and maintain an accurate record for each employee removed from current exposure to lead pursuant to subsection (12) of this section.

(ii) Each record shall include:

(A) The name and social security number of the employee;

(B) The date on each occasion that the employee was removed from current exposure to lead as well as the corresponding date on which the employee was returned to his or her former job status;

(C) A brief explanation of how each removal was or is being accomplished; and

(D) A statement with respect to each removal indicating whether or not the reason for the removal was an elevated blood lead level.

(iii) The employer shall maintain each medical removal record for at least the duration of an employee's employment.

(d) Availability.

(i) The employer shall make available upon request all records required to be maintained by subsection (15) of this section to the director for examination and copying.

(ii) Environmental monitoring, medical removal, and medical records required by this subsection shall be provided upon request to employees, designated representatives, and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217. Medical removal records shall be provided in the same manner as environmental monitoring records.

(iii) Upon request, the employer shall make an employee's medical records required to be maintained by this section available to the affected employee or former employee or to a physician or other individual designated by such affected employee or former employees for examination and copying.

(e) Transfer of records.

(i) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by subsection (15) of this section.

(ii) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records required to be maintained by this section for the prescribed period, these records shall be transmitted to the director.

(iii) At the expiration of the retention period for the records required to be maintained by this section, the employer shall notify the director at least three months prior to the disposal of such records and shall transmit those records to the director if requested within the period.

(iv) The employer shall also comply with any additional requirements involving transfer of records set forth in WAC 296-62-05215.

(16) Observation of monitoring.

(a) Employee observation. The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to lead conducted pursuant to subsection (5) of this section.

(b) Observation procedures.

(i) Whenever observation of the monitoring of employee exposure to lead requires entry into an area where the use of respirators, protective clothing or equipment is required, the employer shall provide the observer with and assure the use of such respirators, clothing and such equipment, and shall require the observer to comply with all other applicable safety and health procedures.

(ii) Without interfering with the monitoring, observers shall be entitled to:

(A) Receive an explanation of the measurement procedures;

(B) Observe all steps related to the monitoring of lead performed at the place of exposure; and

(C) Record the results obtained or receive copies of the results when returned by the laboratory.

(17) Appendices. The information contained in the appendices to this section is not intended by itself, to create any additional obligations not otherwise imposed by this standard nor detract from any existing obligation.

(a) Appendix A. Substance Data Sheet for Occupational Exposure to Lead.

(i) Substance identification.

(A) Substance. Pure lead (Pb) is a heavy metal at room temperature and pressure and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

(B) Compounds covered by the standard. The word "lead" when used in this standard means elemental lead, all inorganic lead compounds (except those which are not biologically available due to either solubility or specific chemical interaction), and a class of organic lead compounds called lead soaps. This standard does not apply to other organic lead compounds.

(C) Uses. Exposure to lead occurs in at least 120 different occupations, including primary and secondary lead smelting, lead storage battery manufacturing, lead pigment manufacturing and use, solder manufacturing and use, shipbuilding and ship repairing, auto manufacturing, and printing.

(D) Permissible exposure. The Permissible Exposure Limit (PEL) set by the standard is 50 micrograms of lead per cubic meter of air (50 $\mu\text{g}/\text{m}^3$), averaged over an eight-hour work day.

(E) Action level. The standard establishes an action level of 30 micrograms per cubic meter of air (30 $\mu\text{g}/\text{m}^3$) time weighted average, based on an eight-hour work day. The action level initiates several requirements of the standard, such as exposure monitoring, medical surveillance, and training and education.

(ii) Health hazard data.

(A) Ways in which lead enters your body.

(I) When absorbed into your body in certain doses lead is a toxic substance. The object of the lead standard is to prevent absorption of harmful quantities of lead. The standard is intended to protect you not only from the immediate toxic effects of lead, but also from the serious toxic effects that may not become apparent until years of exposure have passed.

(II) Lead can be absorbed into your body by inhalation (breathing) and ingestion (eating). Lead (except for certain organic lead compounds not covered by the standard, such as tetraethyl lead) is not absorbed through your skin. When lead is scattered in the air as a dust, fume or mist, it can be inhaled and absorbed through your lungs and upper respiratory tract. Inhalation of airborne lead is generally the most important source of occupational lead absorption. You can also absorb lead through your digestive system if lead gets into your mouth and is swallowed. If you handle food, cigarettes, chewing tobacco, or make-up which have lead on them or handle them with hands contaminated with lead, this will contribute to ingestion.

(III) A significant portion of the lead that you inhale or ingest gets into your blood stream. Once in your blood stream lead is circulated throughout your body and stored in various organs and body tissues. Some of this lead is quickly filtered out of your body and excreted, but some remains in your blood and other tissue. As exposure to lead continues, the amount stored in your body will increase if you are absorbing more lead than your body is excreting. Even though you may not be aware of any immediate symptoms of disease, this lead stored in your tissues can be slowly causing irreversible damage, first to individual cells, then to your organs and whole body systems.

(B) Effects of overexposure to lead.

(I) Short-term (acute) overexposure. Lead is a potent, systemic poison that serves no known useful function once absorbed by your body. Taken in large enough doses, lead can kill you in a matter of days. A condition affecting the brain called acute encephalopathy may arise which develops quickly to seizures, coma, and death from cardiorespiratory arrest. A short-term dose of lead can lead to acute encephalopathy. Short-term occupational exposures of this magnitude are highly unusual, but not impossible. Similar forms of encephalopathy may, however arise from extended, chronic exposure to lower doses of lead. There is no sharp dividing line between rapidly developing acute effects of lead, and chronic effects which take longer to acquire. Lead adversely affects numerous body systems, and causes forms of health impairment and disease which arise after periods of exposure as short as days or as long as several years.

(II) Long-term (chronic) overexposure.

a) Chronic overexposure to lead may result in severe damage to your blood-forming, nervous, urinary and reproductive systems. Some common symptoms of chronic overexposure include loss of appetite, metallic taste in the mouth, anxiety, constipation, nausea, pallor, excessive tiredness, weakness, insomnia, headache, nervous irritability, muscle and joint pain or soreness, fine tremors, numbness, dizziness, hyperactivity and colic. In lead colic there may be severe abdominal pain.

b) Damage to the central nervous system in general and the brain (encephalopathy) in particular is one of the most severe forms of lead poisoning. The most severe, often fatal, form of encephalopathy may be preceded by vomiting, a feeling of dullness progressing to drowsiness and stupor, poor memory, restlessness, irritability, tremor, and convulsions. It may arise suddenly with the onset of seizures, followed by coma, and death. There is a tendency for muscular weakness to develop at the same time. This weakness may progress to paralysis often observed as a characteristic "wrist drop" or "foot drop" and is a manifestation of a disease to the nervous system called peripheral neuropathy.

c) Chronic overexposure to lead also results in kidney disease with few, if any, symptoms appearing until extensive and most likely permanent kidney damage has occurred. Routine laboratory tests reveal the presence of this kidney disease only after about two-thirds of kidney function is lost. When overt symptoms of urinary dysfunction arise, it is often too late to correct or prevent worsening conditions, and progression of kidney dialysis or death is possible.

d) Chronic overexposure to lead impairs the reproductive systems of both men and women. Overexposure to lead may result in decreased sex drive, impotence and sterility in men. Lead can alter the structure of sperm cells raising the risk of birth defects. There is evidence of miscarriage and stillbirth in women whose husbands were exposed to lead or who were exposed to lead themselves. Lead exposure also may result in decreased fertility, and abnormal menstrual cycles in women. The course of pregnancy may be adversely affected by exposure to lead since lead crosses the placental barrier and poses risks to developing fetuses. Children born of parents either one of whom were exposed to excess lead levels are more likely to have birth defects, mental retardation, behavioral disorders or die during the first year of childhood.

e) Overexposure to lead also disrupts the blood-forming system resulting in decreased hemoglobin (the substance in the blood that carries oxygen to the cells) and ultimately anemia. Anemia is characterized by weakness, pallor and fatigability as a result of decreased oxygen carrying capacity in the blood.

(III) Health protection goals of the standard.

a) Prevention of adverse health effects for most workers from exposure to lead throughout a working lifetime requires that worker blood lead (PbB) levels be maintained at or below forty micrograms per one hundred grams of whole blood (40 $\mu\text{g}/100\text{g}$). The blood lead levels of workers (both male and female workers) who intend to have children should be maintained below 30 $\mu\text{g}/100\text{g}$ to minimize adverse reproductive health effects to the parents and to the developing fetus.

b) The measurement of your blood lead level is the most useful indicator of the amount of lead absorbed by your body. Blood lead levels (PbB) are most often reported in units of milligrams (mg) or micrograms (μg) of lead (1 mg=1000 μg) per 100 grams (100g), 100 milliliters (100 ml) or deciliter (dl) of blood. These three units are essentially the same. Sometimes PbB's are expressed in the form of mg% or $\mu\text{g}\%$. This is a shorthand notation for 100g, 100ml, or dl.

c) PbB measurements show the amount of lead circulating in your blood stream, but do not give any information about the amount of lead stored in your various tissues. PbB measurements merely show current absorption of lead, not the effect that lead is having on your body or the effects that past lead exposure may have already caused. Past research into lead-related diseases, however, has focused heavily on associations between PbBs and various diseases. As a result, your PbB is an important indicator of the likelihood that you will gradually acquire a lead-related health impairment or disease.

d) Once your blood lead level climbs above 40 $\mu\text{g}/100\text{g}$, your risk of disease increases. There is a wide variability of individual response to lead, thus it is difficult to say that a particular PbB in a given person will cause a particular effect. Studies have associated fatal encephalopathy with PbBs as low as 150 $\mu\text{g}/100\text{g}$. Other studies have shown other forms of disease in some workers with PbBs well below 80 $\mu\text{g}/100\text{g}$. Your PbB is a crucial indicator of the risks to your health, but one other factor is extremely important. This factor is the length of time you have had elevated PbBs. The longer you have an elevated PbB, the greater the risk that large quantities of lead are being gradually stored in your organs and tissues (body burden). The greater your overall body burden, the greater the chances of substantial permanent damage.

e) The best way to prevent all forms of lead-related impairments and diseases—both short-term and long-term—is to maintain your PbB below 40 $\mu\text{g}/100\text{g}$. The provisions of the standard are designed with this end in mind. Your employer has prime responsibility to assure that the provisions of the standard are complied with both by the company and by individual workers. You as a worker, however, also have a responsibility to assist your employer in complying with the standard. You can play a key role in protecting your own health by learning about the lead hazards and their control, learning what the standard requires, following the standard where it governs your own action, and seeing that your employer complies with the provisions governing his actions.

(IV) Reporting signs and symptoms of health problems. You should immediately notify your employer if you develop signs or symptoms associated with lead poisoning or if you desire medical advice concerning the effects of current or past exposure to lead on your ability to have a healthy child. You should also notify your employer if you have difficulty breathing during a respirator fit test or while wearing a respirator. In each of these cases your employer must make available to you appropriate medical examinations or consultations. These must be provided at no cost to you and at a reasonable time and place.

(b) Appendix B. Employee Standard Summary. This appendix summarizes key provisions of the standard that you as a worker should become familiar with. The appendix discusses the entire standard.

(i) Permissible exposure limit (PEL). The standard sets a permissible exposure limit (PEL) of fifty micrograms of lead per cubic meter of air (50 $\mu\text{g}/\text{m}^3$), averaged over an eight-hour workday. This is the highest level of lead in air to which you may be permissibly exposed over an eight-hour workday. Since it is an eight-hour average it permits short exposures

above the PEL so long as for each eight-hour workday your average exposure does not exceed the PEL.

(ii) Exposure monitoring.

(A) If lead is present in the work place where you work in any quantity, your employer is required to make an initial determination of whether the action level is exceeded for any employee. The initial determination must include instrument monitoring of the air for the presence of lead and must cover the exposure of a representative number of employees who are reasonably believed to have the highest exposure levels. If your employer has conducted appropriate air sampling for lead in the past year he may use these results. If there have been any employee complaints of symptoms which may be attributable to exposure to lead or if there is any other information or observations which would indicate employee exposure to lead, this must also be considered as part of the initial determination. If this initial determination shows that a reasonable possibility exists that any employee may be exposed, without regard to respirators, over the action level ($30 \mu\text{g}/\text{m}^3$) your employer must set up an air monitoring program to determine the exposure level of every employee exposed to lead at your work place.

(B) In carrying out this air monitoring program, your employer is not required to monitor the exposure of every employee, but he or she must monitor a representative number of employees and job types. Enough sampling must be done to enable each employee's exposure level to be reasonably represented by at least one full shift (at least seven hours) air sample. In addition, these air samples must be taken under conditions which represent each employee's regular, daily exposure to lead.

(C) If you are exposed to lead and air sampling is performed, your employer is required to quickly notify you in writing of air monitoring results which represent your exposure. If the results indicate your exposure exceeds the PEL (without regard to your use of respirators), then your employer must also notify you of this in writing, and provide you with a description of the corrective action that will be taken to reduce your exposure.

(D) Your exposure must be rechecked by monitoring every six months if your exposure is over the action level but below the PEL. Air monitoring must be repeated every three months if you are exposed over the PEL. Your employer may discontinue monitoring for you if two consecutive measurements, taken at least two weeks apart, are below the action level. However, whenever there is a production, process, control, or personnel change at your work place which may result in new or additional exposure to lead, or whenever there is any other reason to suspect a change which may result in new or additional exposure to lead, your employer must perform additional monitoring.

(iii) Methods of compliance. Your employer is required to assure that no employee is exposed to lead in excess of the PEL. The standard establishes a priority of methods to be used to meet the PEL.

(iv) Respiratory protection.

(A) Your employer is required to provide and assure your use of respirators when your exposure to lead is not controlled below the PEL by other means. The employer must pay the cost of the respirator. Whenever you request one,

your employer is also required to provide you a respirator even if your air exposure level does not exceed the PEL. You might desire a respirator when, for example, you have received medical advice that your lead absorption should be decreased. Or, you may intend to have children in the near future, and want to reduce the level of lead in your body to minimize adverse reproductive effects. While respirators are the least satisfactory means of controlling your exposure, they are capable of providing significant protection if properly chosen, fitted, worn, cleaned, maintained, and replaced when they stop providing adequate protection.

(B) Your employer is required to select respirators from the seven types listed in Table II of the respiratory protection section of this standard (see subsection (7)(c) of this section). Any respirator chosen must be certified by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 42 CFR part 84. This respirator selection table will enable your employer to choose a type of respirator which will give you a proper amount of protection based on your airborne lead exposure. Your employer may select a type of respirator that provides greater protection than that required by the standard; that is, one recommended for a higher concentration of lead than is present in your work place. For example, a powered air purifying respirator (PAPR) is much more protective than a typical negative-pressure respirator, and may also be more comfortable to wear. A PAPR has a filter, cartridge or canister to clean the air, and a power source which continuously blows filtered air into your breathing zone. Your employer might make a PAPR available to you to ease the burden of having to wear a respirator for long periods of time. The standard provides that you can obtain a PAPR upon request.

(C) Your employer must also start a respiratory protection program. This program must include written procedures for the proper selection, use, cleaning, storage, and maintenance of respirators.

(D) Your employer must assure that your respirator facepiece fits properly. Proper fit of a respirator facepiece is critical to your protection against air borne lead. Obtaining a proper fit on each employee may require your employer to make available several different types of respirator masks. To ensure that your respirator fits properly and that facepiece leakage is minimal, your employer must give you either a qualitative or quantitative fit test as required in chapter 296-62 WAC, Part E.

(E) You must also receive from your employer proper training in the use of respirators. Your employer is required to teach you how to wear a respirator, to know why it is needed, and to understand its limitations.

(F) The standard provides that if your respirator uses filter elements, you must be given an opportunity to change the filter elements whenever an increase in breathing resistance is detected. You also must be permitted to periodically leave your work area to wash your face and respirator facepiece whenever necessary to prevent skin irritation. If you ever have difficulty breathing during a fit test or while using a respirator, your employer must make a medical examination available to you to determine whether you can safely wear a respirator. The result of this examination may be to give you

a positive pressure respirator (which reduces breathing resistance) or to provide alternative means of protection.

(v) Protective work clothing and equipment. If you are exposed to lead above the PEL, or if you are exposed to lead compounds such as lead arsenate or lead azide which can cause skin and eye irritation, your employer must provide you with protective work clothing and equipment appropriate for the hazard. If work clothing is provided, it must be provided in a clean and dry condition at least weekly, and daily if your airborne exposure to lead is greater than 200 $\mu\text{g}/\text{m}^3$. Appropriate protective work clothing and equipment can include coveralls or similar full-body work clothing, gloves, hats, shoes or disposable shoe coverlets, and face shields or vented goggles. Your employer is required to provide all such equipment at no cost to you. He or she is responsible for providing repairs and replacement as necessary and also is responsible for the cleaning, laundering or disposal of protective clothing and equipment. Contaminated work clothing or equipment must be removed in change rooms and not worn home or you will extend your exposure and expose your family since lead from your clothing can accumulate in your house, car, etc. Contaminated clothing which is to be cleaned, laundered or disposed of must be placed in closed containers in the change room. At no time may lead be removed from protective clothing or equipment by any means which disperses lead into the work room air.

(vi) Housekeeping. Your employer must establish a housekeeping program sufficient to maintain all surfaces as free as practicable of accumulations of lead dust. Vacuuming is the preferred method of meeting this requirement, and the use of compressed air to clean floors and other surfaces is absolutely prohibited. Dry or wet sweeping, shoveling, or brushing may not be used except where vacuuming or other equally effective methods have been tried and do not work. Vacuums must be used and emptied in a manner which minimizes the reentry of lead into the work place.

(vii) Hygiene facilities and practices.

(A) The standard requires that change rooms, showers and filtered air lunchrooms be constructed and made available to workers exposed to lead above the PEL. When the PEL is exceeded, the employer must assure that food and beverage is not present or consumed, tobacco products are not present or used, and cosmetics are not applied, except in these facilities. Change rooms, showers and lunchrooms, must be used by workers exposed in excess of the PEL. After showering, no clothing or equipment worn during the shift may be worn home and this includes shoes and underwear. Your own clothing worn during the shift should be carried home and cleaned carefully so that it does not contaminate your home. Lunchrooms may not be entered with protective clothing or equipment unless surface dust has been removed by vacuuming, downdraft booth or other cleaning methods. Finally, workers exposed above the PEL must wash both their hands and faces prior to eating, drinking, smoking or applying cosmetics.

(B) All of the facilities and hygiene practices just discussed are essential to minimize additional sources of lead absorption from inhalation or ingestion of lead that may accumulate on you, your clothes or your possessions. Strict compliance with these provisions can virtually eliminate sev-

eral sources of lead exposure which significantly contribute to excessive lead absorption.

(viii) Medical surveillance.

(A) The medical surveillance program is part of the standard's comprehensive approach to the prevention of lead-related disease. Its purpose is to supplement the main thrust of the standard which is aimed at minimizing airborne concentrations of lead and sources of ingestion. Only medical surveillance can determine if the other provisions of the standard have effectively protected you as an individual. Compliance with the standard's provision will protect most workers from the adverse effects of lead exposure, but may not be satisfactory to protect individual workers (I) who have high body burdens of lead acquired over past years, (II) who have additional uncontrolled sources of nonoccupational lead exposure, (III) who exhibit unusual variations in lead absorption rates, or (IV) who have specific nonwork related medical conditions which could be aggravated by lead exposure (e.g., renal disease, anemia). In addition, control systems may fail, or hygiene and respirator programs may be inadequate. Periodic medical surveillance of individual workers will help detect those failures. Medical surveillance will also be important to protect your reproductive ability - regardless of whether you are a man or a woman.

(B) All medical surveillance required by the standard must be performed by or under the supervision of a licensed physician. The employer must provide required medical surveillance without cost to employees and at a reasonable time and place. The standard's medical surveillance program has two parts - periodic biological monitoring, and medical examinations.

(C) Your employer's obligation to offer medical surveillance is triggered by the results of the air monitoring program. Medical surveillance must be made available to all employees who are exposed in excess of the action level for more than 30 days a year. The initial phase of the medical surveillance program, which included blood lead level tests and medical examinations, must be completed for all covered employees no later than 180 days from the effective date of this standard. Priority within this first round of medical surveillance must be given to employees whom the employer believes to be at greatest risk from continued exposure (for example, those with the longest prior exposure to lead, or those with the highest current exposure). Thereafter, the employer must periodically make medical surveillance - both biological monitoring and medical examinations - available to all covered employees.

(D) Biological monitoring under the standard consists of blood lead level (PbB) and zinc protoporphyrin tests at least every six months after the initial PbB test. A zinc protoporphyrin (ZPP) test is a very useful blood test which measures an effect of lead on your body. If a worker's PbB exceeds 40 $\mu\text{g}/100\text{g}$, the monitoring frequency must be increased from every six months to at least every two months and not reduced until two consecutive PbBs indicate a blood lead level below 40 $\mu\text{g}/100\text{g}$. Each time your PbB is determined to be over 40 $\mu\text{g}/100\text{g}$, your employer must notify you of this in writing within five working days of the receipt of the test results. The employer must also inform you that the standard requires temporary medical removal with economic protec-

tion when your PbB exceeds certain criteria (see Discussion of Medical Removal Protection - subsection (12)). During the first year of the standard, this removal criterion is 80 $\mu\text{g}/100\text{g}$. Anytime your PbB exceeds 80 $\mu\text{g}/100\text{g}$ your employer must make available to you a prompt follow-up PbB test to ascertain your PbB. If the two tests both exceed 80 $\mu\text{g}/100\text{g}$ and you are temporarily removed, then your employer must make successive PbB tests available to you on a monthly basis during the period of your removal.

(E) Medical examinations beyond the initial one must be made available on an annual basis if your blood lead levels exceeds 40 $\mu\text{g}/100\text{g}$ at any time during the preceding year. The initial examination will provide information to establish a baseline to which subsequent data can be compared. An initial medical examination must also be made available (prior to assignment) for each employee being assigned for the first time to an area where the airborne concentration of lead equals or exceeds the action level. In addition, a medical examination or consultation must be made available as soon as possible if you notify your employer that you are experiencing signs or symptoms commonly associated with lead poisoning or that you have difficulty breathing while wearing a respirator or during a respirator fit test. You must also be provided a medical examination or consultation if you notify your employer that you desire medical advice concerning the effects of current or past exposure to lead on your ability to procreate a healthy child.

(F) Finally, appropriate follow-up medical examinations or consultations may also be provided for employees who have been temporarily removed from exposure under the medical removal protection provisions of the standard (see item (ix) below).

(G) The standard specifies the minimum content of pre-assignment and annual medical examinations. The content of other types of medical examinations and consultations is left up to the sound discretion of the examining physician. Pre-assignment and annual medical examinations must include (I) a detailed work history and medical history, (II) a thorough physical examination, and (III) a series of laboratory tests designed to check your blood chemistry and your kidney function. In addition, at any time upon your request, a laboratory evaluation of male fertility will be made (microscopic examination of a sperm sample), or a pregnancy test will be given.

(H) The standard does not require that you participate in any of the medical procedures, tests, etc., which your employer is required to make available to you. Medical surveillance can, however, play a very important role in protecting your health. You are strongly encouraged, therefore, to participate in a meaningful fashion. Generally, your employer will choose the physician who conducts medical surveillance under the lead standard - unless you and your employer can agree on the choice of a physician or physicians. Some companies and unions have agreed in advance, for example, to use certain independent medical laboratories or panels of physicians. Any of these arrangements are acceptable so long as required medical surveillance is made available to workers.

(I) The standard requires your employer to provide certain information to a physician to aid in his or her examina-

tion of you. This information includes (I) the standard and its appendices, (II) a description of your duties as they relate to lead exposure, (III) your exposure level, (IV) a description of personal protective equipment you wear, (V) prior blood level results, and (VI) prior written medical opinions concerning you that the employer has. After a medical examination or consultation the physician must prepare a written report which must contain (I) the physician's opinion as to whether you have any medical conditions which places you at increased risk of material impairment to health from exposure to lead, (II) any recommended special protective measures to be provided to you, (III) any blood lead level determinations, and (IV) any recommended limitation on your use of respirators. This last element must include a determination of whether you can wear a powered air purifying respirator (PAPR) if you are found unable to wear a negative pressure respirator.

(J) The medical surveillance program of the lead standard may at some point in time serve to notify certain workers that they have acquired a disease or other adverse medical condition as a result of occupational lead exposure. If this is true these workers might have legal rights to compensation from public agencies, their employers, firms that supply hazardous products to their employers, or other persons. Some states have laws, including worker compensation laws, that disallow a worker to learn of a job-related health impairment to sue, unless the worker sues within a short period of time after learning of the impairment. (This period of time may be a matter of months or years.) An attorney can be consulted about these possibilities. It should be stressed that WISHA is in no way trying to either encourage or discourage claims or lawsuits. However, since results of the standard's medical surveillance program can significantly affect the legal remedies of a worker who has acquired a job-related disease or impairment, it is proper for WISHA to make you aware of this.

(K) The medical surveillance section of the standard also contains provisions dealing with chelation. Chelation is the use of certain drugs (administered in pill form or injected into the body) to reduce the amount of lead absorbed in body tissues. Experience accumulated by the medical and scientific communities has largely confirmed the effectiveness of this type of therapy for the treatment of very severe lead poisoning. On the other hand it has also been established that there can be a long list of extremely harmful side effects associated with the use of chelating agents. The medical community has balanced the advantages and disadvantages resulting from the use of chelating agents in various circumstances and has established when the use of these agents is acceptable. The standard includes these accepted limitations due to a history of abuse of chelation therapy by some lead companies. The most widely used chelating agents are calcium disodium EDTA, ($\text{Ca Na}_2\text{EDTA}$), Calcium Disodium Versenate (Versenate), and d-penicillamine (penicillamine or Cupramine).

(L) The standard prohibits "prophylactic chelation" of any employee by any person the employer retains, supervises or controls. "Prophylactic chelation" is the routine use of chelating or similarly acting drugs to prevent elevated blood levels in workers who are occupationally exposed to lead, or

the use of these drugs to routinely lower blood lead levels to predesignated concentrations believed to be safe. It should be emphasized that where an employer takes a worker who has no symptoms of lead poisoning and has chelation carried out by a physician (either inside or outside of a hospital) solely to reduce the worker's blood lead level, that will generally be considered prophylactic chelation. The use of a hospital and a physician does not mean that prophylactic chelation is not being performed. Routine chelation to prevent increased or reduce current blood lead levels is unacceptable whatever the setting.

(M) The standard allows the use of "therapeutic" or "diagnostic" chelation if administered under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring. Therapeutic chelation responds to severe lead poisoning where there are marked symptoms. Diagnostic chelation, involves giving a patient a dose of the drug then collecting all urine excreted for some period of time as an aid to the diagnosis of lead poisoning.

(N) In cases where the examining physician determines that chelation is appropriate, you must be notified in writing of this fact before such treatment. This will inform you of a potentially harmful treatment, and allow you to obtain a second opinion.

(ix) Medical removal protection.

(A) Excessive lead absorption subjects you to increased risk of disease. Medical removal protection (MRP) is a means of protecting you when for whatever reasons, other methods, such as engineering controls, work practices, and respirators, have failed to provide the protection you need. MRP involves the temporary removal of a worker from his or her regular job to a place of significantly lower exposure without any loss of earnings, seniority, or other employment rights of benefits. The purpose of this program is to cease further lead absorption and allow your body to naturally excrete lead which has previously been absorbed. Temporary medical removal can result from an elevated blood lead level, or a medical opinion. Up to eighteen months of protection is provided as a result of either form of removal. The vast majority of removed workers, however, will return to their former jobs long before this eighteen month period expires. The standard contains special provisions to deal with the extraordinary but possible case where a long-term worker's blood lead level does not adequately decline during eighteen months of removal.

(B) During the first year of the standard, if your blood lead level is 80 µg/100g or above you must be removed from any exposure where your air lead level without a respirator would be 100 µg/m³ or above. If you are removed from your normal job you may not be returned until your blood lead level declines to at least 60 µg/100g. These criteria for removal and return will change according to the following schedule:

TABLE 1

Effective Date	Removal Blood Level (µg/100g)	Air Lead (µg/m ³)	Return Blood Lead (µg/100g)
9/6/81	At or above 70	50 or above	At or below 50
9/6/82	At or above 60	30 or above	At or below 40
9/6/84	At or above 50 averaged over six months	30 or above	At or below 40

(C) You may also be removed from exposure even if your blood lead levels are below these criteria if a final medical determination indicates that you temporarily need reduced lead exposure for medical reasons. If the physician who is implementing your employer's medical program makes a final written opinion recommending your removal or other special protective measures, your employer must implement the physician's recommendation. If you are removed in this manner, you may only be returned when the physician indicates it is safe for you to do so.

(D) The standard does not give specific instructions dealing with what an employer must do with a removed worker. Your job assignment upon removal is a matter for you, your employer and your union (if any) to work out consistent with existing procedures for job assignments. Each removal must be accomplished in a manner consistent with existing collective bargaining relationships. Your employer is given broad discretion to implement temporary removals so long as no attempt is made to override existing agreements. Similarly, a removed worker is provided no right to veto an employer's choice which satisfies the standard.

(E) In most cases, employers will likely transfer removed employees to other jobs with sufficiently low lead exposure. Alternatively, a worker's hours may be reduced so that the time weighted average exposure is reduced, or he or she may be temporarily laid off if no other alternative is feasible.

(F) In all of these situations, MRP benefits must be provided during the period of removal - i.e., you continue to receive the same earnings, seniority, and other rights and benefits you would have had if you had not been removed. Earnings include more than just your base wage; it includes overtime, shift differentials, incentives, and other compensation you would have earned if you had not been removed. During the period of removal you must also be provided with appropriate follow-up medical surveillance. If you were removed because your blood lead level was too high, you must be provided with a monthly blood test. If a medical opinion caused your removal, you must be provided medical tests or examinations that the physician believes to be appropriate. If you do not participate in this follow-up medical surveillance, you may lose your eligibility for MRP benefits.

(G) When you are medically eligible to return to your former job, your employer must return you to your "former job status." This means that you are entitled to the position, wages, benefits, etc., you would have had if you had not been removed. If you would still be in your old job if no removal had occurred, that is where you go back. If not, you are returned consistent with whatever job assignment discretion your employer would have had if no removal had occurred. MRP only seeks to maintain your rights, not expand them or diminish them.

(H) If you are removed under MRP and you are also eligible for worker compensation or other compensation for lost wages, your employer's MRP benefits obligation is reduced by the amount that you actually receive from these other sources. This is also true if you obtain other employment during the time you are laid off with MRP benefits.

(I) The standard also covers situations where an employer voluntarily removes a worker from exposure to

lead due to the effects of lead on the employee's medical condition, even though the standard does not require removal. In these situations MRP benefits must still be provided as though the standard required removal. Finally, it is important to note that in all cases where removal is required, respirators cannot be used as a substitute. Respirators may be used before removal becomes necessary, but not as an alternative to a transfer to a low exposure job, or to a lay-off with MRP benefits.

(x) Employee information and training.

(A) Your employer is required to provide an information and training program for all employees exposed to lead above the action level or who may suffer skin or eye irritation from lead. This program must inform these employees of the specific hazards associated with their work environment, protective measures which can be taken, the danger of lead to their bodies (including their reproductive systems), and their rights under the standard. In addition, your employer must make readily available to all employees, including those exposed below the action level, a copy of the standard and its appendices and must distribute to all employees any materials provided to the employer under the Washington Industrial Safety and Health Act (WISHA).

(B) Your employer is required to complete this training for all employees by March 4, 1981. After this date, all new employees must be trained prior to initial assignment to areas where there is possibility of exposure over the action level. This training program must also be provided at least annually thereafter.

(xi) Signs. The standard requires that the following warning sign be posted in work areas where the exposure to lead exceeds the PEL:

WARNING
LEAD WORK AREA
NO SMOKING OR EATING

(xii) Recordkeeping.

(A) Your employer is required to keep all records of exposure monitoring for airborne lead. These records must include the name and job classification of employees measured, details of the sampling and analytic techniques, the results of this sampling and the type of respiratory protection being worn by the person sampled. Your employer is also required to keep all records of biological monitoring and medical examination results. These must include the names of the employees, the physician's written opinion and a copy of the results of the examination. All of the above kinds of records must be kept for 40 years, or for at least 20 years after your termination of employment, whichever is longer.

(B) Recordkeeping is also required if you are temporarily removed from your job under the MRP program. This record must include your name and social security number, the date of your removal and return, how the removal was or is being accomplished, and whether or not the reason for the removal was an elevated blood lead level. Your employer is required to keep each medical removal record only for as long as the duration of an employee's employment.

(C) The standard requires that if you request to see or copy environmental monitoring, blood lead level monitoring, or medical removal records, they must be made available to

you or to a representative that you authorize. Your union also has access to these records. Medical records other than PbBs must also be provided to you upon request, to your physician or to any other person whom you may specifically designate. Your union does not have access to your personal medical records unless you authorize their access.

(xiii) Observations of monitoring. When air monitoring for lead is performed at your work place as required by this standard, your employer must allow you or someone you designate to act as an observer of the monitoring. Observers are entitled to an explanation of the measurement procedure, and to record the results obtained. Since results will not normally be available at the time of the monitoring, observers are entitled to record or receive the results of the monitoring when returned by the laboratory. Your employer is required to provide the observer with any personal protective devices required to be worn by employees working in the areas that is being monitored. The employer must require the observer to wear all such equipment and to comply with all other applicable safety and health procedures.

(xiv) Effective date. The standard's effective date is September 6, 1980, and the employer's obligation under the standard begin to come into effect as of that date. The standard was originally adopted as WAC 296-62-07349 and later recodified to WAC 296-62-07521.

(c) Appendix C. Medical Surveillance Guidelines.

(i) Introduction.

(A) The primary purpose of the Washington Industrial Safety and Health Act of 1973 is to assure, so far as possible, safe and healthful working conditions for every working man and woman. The occupational health standard for inorganic lead* was promulgated to protect workers exposed to inorganic lead including metallic lead, all inorganic lead compounds and organic lead soaps.

*The term inorganic lead used throughout the medical surveillance appendices is meant to be synonymous with the definition of lead set forth in the standard.

(B) Under this final standard in effect as of September 6, 1980, occupational exposure to inorganic lead is to be limited to 50 $\mu\text{g}/\text{m}^3$ (micrograms per cubic meter) based on an eight-hour time-weighted average (TWA). This level of exposure eventually must be achieved through a combination of engineering, work practice and other administrative controls. Periods of time ranging from one to ten years are provided for different industries to implement these controls which are based on individual industry considerations. Until these controls are in place, respirators must be used to meet the 50 $\mu\text{g}/\text{m}^3$ exposure limit.

(C) The standard also provides for a program of biological monitoring and medical surveillance for all employees exposed to levels of inorganic lead above the action level of 30 $\mu\text{g}/\text{m}^3$ for more than thirty days per year.

(D) The purpose of this document is to outline the medical surveillance provisions of the standard for inorganic lead, and to provide further information to the physician regarding the examination and evaluation of workers exposed to inorganic lead.

(E) Item (ii) provides a detailed description of the monitoring procedure including the required frequency of blood testing for exposed workers, provisions for medical removal

protection (MRP), the recommended right of the employee to a second medical opinion, and notification and recordkeeping requirements of the employer. A discussion of the requirements for respirator use and respirator monitoring and WISHA's position on prophylactic chelation therapy are also included in this section.

(F) Item (iii) discusses the toxic effects and clinical manifestations of lead poisoning and effects of lead intoxication on enzymatic pathways in heme synthesis. The adverse effects on both male and female reproductive capacity and on the fetus are also discussed.

(G) Item (iv) outlines the recommended medical evaluation of the worker exposed to inorganic lead including details of the medical history, physical examination, and recommended laboratory tests, which are based on the toxic effects of lead as discussed in item (ii).

(H) Item (v) provides detailed information concerning the laboratory tests available for the monitoring of exposed workers. Included also is a discussion of the relative value of each test and the limitations and precautions which are necessary in the interpretation of the laboratory results.

(I) Airborne levels to be achieved without reliance on respirator protection through a combination of engineering and work practice or other administrative controls are illustrated in the following table:

Industry	Permissible Lead Level/Compliance Date		
	200µg/m ³	100µg/m ³	50µg/m ³
Primary Lead Production	1973	06/29/84	06/29/91
Secondary Lead Production	1973	06/29/84	06/29/91
Lead Acid Battery Manufacturing	1973	06/29/83	06/29/91
Automobile Mfg./Solder, Grinding	1973	N/A	03/08/97
Electronics, Gray Iron Foundries, Ink Mfg., Paints and Coatings Mfg., Can Mfg., Wallpaper Mfg., and Printing.	1973	N/A	06/29/91
Lead Chemical Mfg., Non-ferrous Foundries, Leaded Steel Mfg., Battery Breaking in the Collection and Processing of Scrap (when not a part of secondary lead smelter) Secondary Copper Smelter, Brass and Bronze Ingot Production.	1973	N/A	N/A ^{1*}
All Other Industries	1973	N/A	09/08/92

* Feasibility of achieving the PEL by engineering and work practice controls for these industries has yet to be resolved in court, therefore no date has been scheduled.

(ii) Medical surveillance and monitoring requirements for workers exposed to inorganic lead.

(A) Under the occupational health standard for inorganic lead, a program of biological monitoring and medical surveillance is to be made available to all employees exposed to lead above the action level of 30 µg/m³ TWA for more than thirty days each year. This program consists of periodic blood sampling and medical evaluation to be performed on a schedule which is defined by previous laboratory results, worker complaints or concerns, and the clinical assessment of the examining physician.

(B) Under this program, the blood lead level of all employees who are exposed to lead above the action level of 30 µg/m³ is to be determined at least every six months. The frequency is increased to every two months for employees whose last blood lead level was between 40 µg/100g whole blood and the level requiring employee medical removal to be discussed below. For employees who are removed from exposure to lead due to an elevated blood lead, a new blood lead level must be measured monthly. Zinc protoporphyrin (ZPP) measurement is required on each occasion that a blood lead level measurement is made.

(C) An annual medical examination and consultation performed under the guidelines discussed in item (iv) is to be made available to each employee for whom a blood test conducted at any time during the preceding twelve months indicated a blood lead level at or above 40 µg/100g. Also, an examination is to be given to all employees prior to their assignment to an area in which airborne lead concentrations reach or exceed the action level. In addition, a medical examination must be provided as soon as possible after notification by an employee that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice regarding lead exposure and the ability to procreate a healthy child, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during respirator use. An examination is also to be made available to each employee removed from exposure to lead due to a risk of sustaining material impairment to health, or otherwise limited or specially protected pursuant to medical recommendations.

(D) Results of biological monitoring or the recommendations of an examining physician may necessitate removal of an employee from further lead exposure pursuant to the standard's medical removal program (MRP). The object of the MRP program is to provide temporary medical removals to workers either with substantially elevated blood lead levels or otherwise at risk of sustaining material health impairment from continued substantial exposure to lead. The following guidelines which are summarized in Table 10 were created under the standard for the temporary removal of an exposed employee and his or her subsequent return to work in an exposure area.

TABLE 10

EFFECTIVE DATE

	Sept. 6, 1980	Sept. 6, 1981	Sept. 6, 1982	Sept. 6, 1983	Sept. 6, 1984
A. Blood lead level requiring employee medical removal (level must be confirmed with second follow-up blood lead level within two weeks of first report).	>80 µg/100g.	>70 µg/100g.	>60 µg/100g.	>60 µg/100g.	>60 µg/100g or average of last three blood samples or all blood samples over previous 6 months (whichever is over a longer time period) is 50 µg/100g. or greater unless last sample is 40 µg/100g or less.
B. Frequency which employees exposed is action level of lead (30 µg/m ⁸ TWA) must have blood lead level checked. (ZPP is also required in each occasion that a blood test is obtained):					
1. Last blood lead level less than 40 µg/100g	Every 6 months.	Every 6 months.	Every 6 months.	Every 6 months.	Every 6 months.
2. Last blood lead level between 40 µg/100g and level requiring medical removal (see A above)	Every 2 months.	Every 2 months.	Every 2 months.	Every 2 months.	Every 2 months.
3. Employees removed from exposure to lead because of an elevated blood lead level	Every 1 month.	Every 1 month.	Every 1 month.	Every 1 month.	Every 1 month.
C. Permissible airborne exposure limit for workers removed from work due to an elevated blood lead level (without regard to respirator protection).	100 µg/m ³ 8 hr TWA	50 µg/m ³ 8 hr TWA	30 µg/m ³ 8 hr TWA	30 µg/m ³ 8 hr TWA	30 µg/m ³ 8 hr TWA
D. Blood lead level confirmed with a second blood analysis, at which employee may return to work. Permissible exposure without regard to respirator protection is listed by industry in Table 1.	60 µg/100g	50 µg/100g	40 µg/100g	40 µg/100g	40 µg/100g

Note: Where medical opinion indicates that an employee is at risk of material impairment from exposure to lead, the physician can remove an employee from exposure exceeding the action level (or less) or recommend special protective measures as deemed appropriate and necessary. Medical monitoring during the medical removal period can be more stringent than noted in the table above if the physician so specifies. Return to work or removal of limitations and special protections is permitted when the physician indicates that the worker is no longer at risk of material impairment.

(E) Under the standard's ultimate worker removal criteria, a worker is to be removed from any work having any eight-hour TWA exposure to lead of 30 µg/m³ or more whenever either of the following circumstances apply. (I) a blood lead level of 60 µg/100g or greater is obtained and confirmed by a second follow-up blood lead level performed within two weeks after the employer receives the results of the first blood sample test, or (II) the average of the previous three blood lead determinations or the average of all blood lead determinations conducted during the previous six months, whichever encompasses the longest time period, equals or exceeds 50 µg/100g, unless the last blood sample indicates a blood lead level at or below 40 µg/100g, in which case the employee need not be removed. Medical removal is to continue until two consecutive blood lead levels are 40 µg/100g or less.

(F) During the first two years that the ultimate removal criteria are being phased in, the return criteria have been set to assure that a worker's blood lead level has substantially declined during the period of removal. From March 1, 1979,

to March 1, 1980, the blood lead level requiring employee medical removal is 80 µg/100g. Workers found to have a confirmed blood lead at this level or greater need only be removed from work having a daily eight hour TWA exposure to lead at or above 100 µg/m³. Workers so removed are to be returned to work when their blood lead levels are at or below 60 µg/100g of whole blood. From March 1, 1980, to March 1, 1981, the blood lead level requiring medical removal is 70 µg/100g. During this period workers need only be removed from jobs having a daily eight hour TWA exposure to lead at or above 50 µg/m³ and are to be returned to work when a level of 50 µg/100g is achieved. Beginning March 1, 1981, return depends on the worker's blood lead level declining to 40 µg/100g of whole blood.

(G) As part of the standard, the employer is required to notify in writing each employee whose whole blood lead level exceeds 40 µg/100g. In addition, each such employee is to be informed that the standard requires medical removal with MRP benefits, discussed below, when an employee's blood lead level exceeds the above defined limits.

(H) In addition to the above blood lead level criteria, temporary worker removal may also take place as a result of medical determinations and recommendations. Written medical opinions must be prepared after each examination pursuant to the standard. If the examining physician includes medical finding, determination or opinion that the employee has a medical condition which places the employee at increased risk of material health impairment from exposure to lead, then the employee must be removed from exposure to lead at or above the action level. Alternatively, if the examining physician recommends special protective measures for an employee (e.g., use of a powered air purifying respirator) or recommends limitations on an employee's exposure to lead, then the employer must implement these recommendations. Recommendations may be more stringent than the specific provisions of the standard. The examining physician, therefore, is given broad flexibility to tailor special protective procedures to the needs of individual employees. This flexibility extends to the evaluation and management of pregnant workers and male and female workers who are planning to conceive children. Based on the history, physical examination, and laboratory studies, the physician might recommend special protective measures or medical removal for an employee who is pregnant or who is planning to conceive a child when, in the physician's judgment, continued exposure to lead at the current job would pose a significant risk. The return of the employee to his or her former job status, or the removal of special protections or limitations, depends upon the examining physician determining that the employee is no longer at increased risk of material impairment or that the special measures are no longer needed.

(I) During the period of any form of special protection or removal, the employer must maintain the worker's earnings, seniority, and other employment rights and benefits (as though the worker has not been removed) for a period of up to eighteen months. This economic protection will maximize meaningful worker participation in the medical surveillance program, and is appropriate as part of the employer's overall obligation to provide a safe and healthful work place. The provisions of MRP benefits during the employee's removal period may, however, be conditioned upon participation in medical surveillance.

(J) On rare occasions, an employee's blood lead level may not acceptably decline within eighteen months of removal. This situation will arise only in unusual circumstances, thus the standard relies on an individual medical examination to determine how to protect such an employee. This medical determination is to be based on both laboratory values, including lead levels, zinc protoporphyrin levels, blood counts, and other tests felt to be warranted, as well as the physician's judgment that any symptoms or findings on physical examination are a result of lead toxicity. The medical determination may be that the employee is incapable of ever safely returning to his or her former job status. The medical determination may provide additional removal time past eighteen months for some employees or specify special protective measures to be implemented.

(K) The lead standard provides for a multiple physician review in cases where the employee wishes a second opinion concerning potential lead poisoning or toxicity. If an

employee wishes a second opinion, he or she can make an appointment with a physician of his or her choice. This second physician will review the findings, recommendations or determinations of the first physician and conduct any examinations, consultations or tests deemed necessary in an attempt to make a final medical determination. If the first and second physicians do not agree in their assessment they must try to resolve their differences. If they cannot reach an agreement then they must designate a third physician to resolve the dispute.

(L) The employer must provide examining and consulting physicians with the following specific information: A copy of the lead regulations and all appendices, a description of the employee's duties as related to exposure, the exposure level to lead and any other toxic substances (if applicable), a description of personal protective equipment used, blood lead levels, and all prior written medical opinions regarding the employee in the employer's possession or control. The employer must also obtain from the physician and provide the employee with a written medical opinion containing blood lead levels, the physician's opinion as to whether the employee is at risk of material impairment to health, any recommended protective measures for the employee if further exposure is permitted, as well as any recommended limitations upon an employee's use of respirators.

(M) Employers must instruct each physician not to reveal to the employer in writing or in any other way his or her findings, laboratory results, or diagnoses which are felt to be unrelated to occupational lead exposure. They must also instruct each physician to advise the employee of any occupationally or nonoccupationally related medical condition requiring further treatment or evaluation.

(N) The standard provides for the use of respirators when engineering and other primary controls have not been fully implemented. However, the use of respirator protection shall not be used in lieu of temporary medical removal due to elevated blood lead levels or findings that an employee is at risk of material health impairment. This is based on the numerous inadequacies of respirators including skin rash where the facepiece makes contact with the skin, unacceptable stress to breathing in some workers with underlying cardiopulmonary impairment, difficulty in providing adequate fit, the tendency for respirators to create additional hazards by interfering with vision, hearing, and mobility, and the difficulties of assuring the maximum effectiveness of a complicated work practice program involving respirators. Respirators do, however, serve a useful function where engineering and work practice are inadequate by providing interim or short-term protection, provided they are properly selected for the environment in which the employee will be working, properly fitted to the employee, maintained and cleaned periodically, and worn by the employee when required.

(O) In its final standard on occupational exposure to inorganic lead, WISHA has prohibited prophylactic chelation. Diagnostic and therapeutic chelation are permitted only under the supervision of a licensed physician with appropriate medical monitoring in an acceptable clinical setting. The decision to initiate chelation therapy must be made on an individual basis and take into account the severity of symptoms felt to be a result of lead toxicity along with blood lead

levels, ZPP levels and other laboratory tests as appropriate. EDTA and penicillamine, which are the primary chelating agents used in the therapy of occupational lead poisoning, have significant potential side effects and their use must be justified on the basis of expected benefits to the worker.

(P) Unless frank and severe symptoms are present, therapeutic chelation is not recommended given the opportunity to remove a worker from exposure and allow the body to naturally excrete accumulated lead. As a diagnostic aid, the chelation mobilization test using CA-EDTA has limited applicability. According to some investigators, the tests can differentiate between lead-induced and other nephropathies. The test may also provide an estimation of the mobile fraction of the total body lead burden.

(Q) Employers are required to assure that accurate records are maintained on exposure monitoring, medical surveillance, and medical removal for each employee. Exposure monitoring and medical surveillance records must be kept for forty years or the duration of employment plus twenty years, whichever is longer, while medical removal records must be maintained for the duration of employment. All records required under the standard must be made available upon request to representatives of the director of the department of labor and industries. Employers must also make environmental and biological monitoring and medical removal records available to affected employees and to former employees or their authorized employee representatives. Employees or their specifically designated representatives have access to their entire medical surveillance records.

(R) In addition, the standard requires that the employer inform all workers exposed to lead at or above the action level of the provisions of the standard and all its appendices, the purpose and description of medical surveillance and provisions for medical removal protection if temporary removal is required. An understanding of the potential health effects of lead exposure by all exposed employees along with full understanding of their rights under the lead standard is essential for an effective monitoring program.

(iii) Adverse health effects of inorganic lead.

(A) Although the toxicity of lead has been known for 2,000 years, the knowledge of the complex relationship between lead exposure and human response is still being refined. Significant research into the toxic properties of lead continues throughout the world, and it should be anticipated that our understanding of thresholds of effects and margins of safety will be improved in future years. The provisions of the lead standard are founded on two prime medical judgments; first, the prevention of adverse health effects from exposure to lead throughout a working lifetime requires that worker blood lead levels be maintained at or below 40 µg/100g, and second, the blood lead levels of workers, male or female, who intend to parent in the near future should be maintained below 30 µg/100g to minimize adverse reproduction health effects to the parent and developing fetus. The adverse effects of lead on reproduction are being actively researched and WISHA encourages the physician to remain abreast of recent developments in the area to best advise pregnant workers or workers planning to conceive children.

(B) The spectrum of health effects caused by lead exposure can be sub-divided into five developmental states; nor-

mal, physiological changes of uncertain significance, pathophysiological changes, overt symptoms (morbidity), and mortality. Within this process there are no sharp distinctions, but rather a continuum of effects. Boundaries between categories overlap due to the wide variation of individual responses and exposures in the working population. WISHA's development of the lead standard focused on pathophysiological changes as well as later stages of disease.

(I) Heme synthesis inhibition.

a) The earliest demonstrated effect of lead involves its ability to inhibit at least two enzymes of the heme synthesis pathway at very low blood levels. Inhibition of delta aminolevulinic acid dehydrase (ALA-D) which catalyzes the conversion of delta-aminolevulinic acid (ALA) to protoporphyrin is observed at a blood lead level below 20 µg/100g whole blood. At a blood lead level of 40 µg/100g, more than twenty percent of the population would have seventy percent inhibition of ALA-D. There is an exponential increase in ALA excretion at blood lead levels greater than 40 µg/100g.

b) Another enzyme, ferrochelatase, is also inhibited at low blood lead levels. Inhibition of ferrochelatase leads to increased free erythrocyte protoporphyrin (FEP) in the blood which can then bind to zinc to yield zinc protoporphyrin. At a blood lead level of 50 µg/100g or greater, nearly 100 percent of the population will have an increase FEP. There is also an exponential relationship between blood lead levels greater than 40 µg/100g and the associated ZPP level, which has led to the development of the ZPP screening test for lead exposure.

c) While the significance of these effects is subject to debate, it is WISHA's position that these enzyme disturbances are early stages of a disease process which may eventually result in the clinical symptoms of lead poisoning. Whether or not the effects do progress to the later stages of clinical disease, disruption of these enzyme processes over a working lifetime is considered to be a material impairment of health.

d) One of the eventual results of lead-induced inhibition of enzymes in the heme synthesis pathway is anemia which can be asymptomatic if mild but associated with a wide array of symptoms including dizziness, fatigue, and tachycardia when more severe. Studies have indicated that lead levels as low as 50 µg/100g can be associated with a definite decreased hemoglobin, although most cases of lead-induced anemia, as well as shortened red-cell survival times, occur at lead levels exceeding 80 µg/100g. Inhibited hemoglobin synthesis is more common in chronic cases whereas shortened erythrocyte life span is more common in acute cases.

e) In lead-induced anemias, there is usually a reticulocytosis along with the presence of basophilic stippling, and ringed sideroblasts, although none of the above are pathognomonic for lead-induced anemia.

(II) Neurological effects.

a) Inorganic lead had been found to have toxic effects on both the central and peripheral nervous systems. The earliest stage of lead-induced central nervous system effects first manifest themselves in the form of behavioral disturbances and central nervous system symptoms including irritability, restlessness, insomnia and other sleep disturbances, fatigue,

vertigo, headache, poor memory, tremor, depression, and apathy. With more severe exposure, symptoms can progress to drowsiness, stupor, hallucinations, delirium, convulsions and coma.

b) The most severe and acute form of lead poisoning which usually follows ingestion or inhalation of large amounts of lead is acute encephalopathy which may arise precipitously with the onset of intractable seizures, coma, cardiorespiratory arrest, and death within 48 hours.

c) While there is disagreement about what exposure levels are needed to produce the earliest symptoms, most experts agree that symptoms definitely can occur at blood lead levels of 60 $\mu\text{g}/100\text{g}$ whole blood and therefore recommend a 40 $\mu\text{g}/100\text{g}$ maximum. The central nervous system effects frequently are not reversible following discontinued exposure or chelation therapy and when improvement does occur, it is almost always only partial.

d) The peripheral neuropathy resulting from lead exposure characteristically involves only motor function with minimal sensory damage and has a marked predilection for the extensor muscles of the most active extremity. The peripheral neuropathy can occur with varying degrees of severity. The earliest and mildest form which can be detected in workers with blood lead levels as low as 50 $\mu\text{g}/100\text{g}$ is manifested by slowing or motor nerve conduction velocity often without clinical symptoms. With progression of the neuropathy there is development of painless extensor muscle weakness usually involving the extensor muscles of the fingers and hand in the most active upper extremity, followed in severe cases by wrist drop, much less commonly, foot drop.

e) In addition to slowing of nerve conduction, electromyographical studies in patients with blood lead levels greater than 50 $\mu\text{g}/100\text{g}$ have demonstrated a decrease in the number of acting motor unit potentials, an increase in the duration of motor unit potentials, and spontaneous pathological activity including fibrillations and fasciculation. Whether these effects occur at levels of 40 $\mu\text{g}/100\text{g}$ is undetermined.

f) While the peripheral neuropathies can occasionally be reversed with therapy, again such recovery is not assured particularly in the more severe neuropathies and often improvement is only partial. The lack of reversibility is felt to be due in part to segmental demyelination.

(III) Gastrointestinal. Lead may also effect the gastrointestinal system producing abdominal colic or diffuse abdominal pain, constipation, obstipation, diarrhea, anorexia, nausea and vomiting. Lead colic rarely develops at blood lead levels below 80 $\mu\text{g}/100\text{g}$.

(IV) Renal.

a) Renal toxicity represents one of the most serious health effects of lead poisoning. In the early stages of disease nuclear inclusion bodies can frequently be identified in proximal renal tubular cells. Renal functions remain normal and the changes in this stage are probably reversible. With more advanced disease there is progressive interstitial fibrosis and impaired renal function. Eventually extensive interstitial fibrosis ensues with sclerotic glomeruli and dilated and atrophied proximal tubules; all represent end stage kidney disease. Azotemia can be progressive, eventually resulting in frank uremia necessitating dialysis. There is occasionally

associated hypertension and hyperuricemia with or without gout.

b) Early kidney disease is difficult to detect. The urinalysis is normal in early lead nephropathy and the blood urea nitrogen and serum creatinine increase only when two-thirds of kidney function is lost. Measurement of creatinine clearance can often detect earlier disease as can other methods of measurement of glomerular filtration rate. An abnormal Ca-EDTA mobilization test has been used to differentiate between lead-induced and other nephropathies, but this procedure is not widely accepted. A form of Fanconi syndrome with aminoaciduria, glycosuria, and hyperphosphaturia indicating severe injury to the proximal renal tubules is occasionally seen in children.

(V) Reproductive effects.

a) Exposure to lead can have serious effects on reproductive function in both males and females. In male workers exposed to lead there can be a decrease in sexual drive, impotence, decreased ability to produce healthy sperm, and sterility. Malformed sperm (teratospermia), decreased number of sperm (hypospermia), and sperm with decreased motility (asthenospermia) can occur. Teratospermia has been noted at mean blood lead levels of 53 $\mu\text{g}/100\text{g}$ and hypospermia and asthenospermia at 41 $\mu\text{g}/100\text{g}$. Furthermore, there appears to be a dose-response relationship for teratospermia in lead exposed workers.

b) Women exposed to lead may experience menstrual disturbances including dysmenorrhea, menorrhagia and amenorrhea. Following exposure to lead, women have a higher frequency of sterility, premature births, spontaneous miscarriages, and stillbirths.

c) Germ cells can be affected by lead and cause genetic damage in the egg or sperm cells before conception and result in failure to implant, miscarriage, stillbirth, or birth defects.

d) Infants of mothers with lead poisoning have a higher mortality during the first year and suffer from lowered birth weights, slower growth, and nervous system disorders.

e) Lead can pass through the placental barrier and lead levels in the mother's blood are comparable to concentrations of lead in the umbilical cord at birth. Transplacental passage becomes detectable at 12-14 weeks of gestation and increases until birth.

f) There is little direct data on damage to the fetus from exposure to lead but it is generally assumed that the fetus and newborn would be at least as susceptible to neurological damage as young children. Blood lead levels of 50-60 $\mu\text{g}/100\text{g}$ in children can cause significant neurobehavioral impairments, and there is evidence of hyperactivity at blood levels as low as 25 $\mu\text{g}/100\text{g}$. Given the overall body of literature concerning the adverse health effects of lead in children, WISHA feels that the blood lead level in children should be maintained below 30 $\mu\text{g}/100\text{g}$ with a population mean of 15 $\mu\text{g}/100\text{g}$. Blood lead levels in the fetus and newborn likewise should not exceed 30 $\mu\text{g}/100\text{g}$.

g) Because of lead's ability to pass through the placental barrier and also because of the demonstrated adverse effects of lead on reproductive function in both males and females as well as the risk of genetic damage of lead on both the ovum and sperm, WISHA recommends a 30 $\mu\text{g}/100\text{g}$ maximum

permissible blood lead level in both males and females who wish to bear children.

(IV) Other toxic effects.

a) Debate and research continue on the effects of lead on the human body. Hypertension has frequently been noted in occupationally exposed individuals although it is difficult to assess whether this is due to lead's adverse effects on the kidneys or if some other mechanism is involved.

b) Vascular and electrocardiographic changes have been detected but have not been well characterized. Lead is thought to impair thyroid function and interfere with the pituitary-adrenal axis, but again these effects have not been well defined.

(iv) Medical evaluation.

(A) The most important principle in evaluating a worker for any occupational disease including lead poisoning is a high index of suspicion on the part of the examining physician. As discussed in Section (ii), lead can affect numerous organ systems and produce a wide array of signs and symptoms, most of which are nonspecific and subtle in nature at least in the early stages of disease. Unless serious concern for lead toxicity is present, many of the early clues to diagnosis may easily be overlooked.

(B) The crucial initial step in the medical evaluation is recognizing that a worker's employment can result in exposure to lead. The worker will frequently be able to define exposures to lead and lead-containing materials but often will not volunteer this information unless specifically asked. In other situations the worker may not know of any exposures to lead but the suspicion might be raised on the part of the physician because of the industry or occupation of the worker. Potential occupational exposure to lead and its compounds occur in at least 120 occupations, including lead smelting, the manufacture of lead storage batteries, the manufacture of lead pigments and products containing pigments, solder manufacture, shipbuilding and ship repair, auto manufacturing, construction, and painting.

(C) Once the possibility for lead exposure is raised, the focus can then be directed toward eliciting information from the medical history, physical exam, and finally from laboratory data to evaluate the worker for potential lead toxicity.

(D) A complete and detailed work history is important in the initial evaluation. A listing of all previous employment with information on work processes, exposure to fumes or dust, known exposures to lead or other toxic substances, respiratory protection used, and previous medical surveillance should all be included in the worker's record. Where exposure to lead is suspected, information concerning on-the-job personal hygiene, smoking or eating habits in work areas, laundry procedures, and use of any protective clothing or respiratory protection equipment should be noted. A complete work history is essential in the medical evaluation of a worker with suspected lead toxicity, especially when long-term effects such as neurotoxicity and nephrotoxicity are considered.

(E) The medical history is also of fundamental importance and should include a listing of all past and current medical conditions, current medications including proprietary drug intake, previous surgeries and hospitalizations, allergies, smoking history, alcohol consumption, and also nonoccupational lead exposures such as hobbies (hunting, riflery).

Also known childhood exposures should be elicited. Any previous history of hematological, neurological, gastrointestinal, renal, psychological, gynecological, genetic, or reproductive problems should be specifically noted.

(F) A careful and complete review of systems must be performed to assess both recognized complaints and subtle or slowly acquired symptoms which the worker might not appreciate as being significant. The review of symptoms should include the following:

General	- weight loss, fatigue, decreased appetite.
Head, Eyes, Ears, Nose, Throat (HEENT)	- headaches, visual disturbance or decreased visual acuity, hearing deficits or tinnitus, pigmentation of the oral mucosa, or metallic taste in mouth.
Cardiopulmonary	- shortness of breath, cough, chest pains, palpitations, or orthopnea.
Gastrointestinal	- nausea, vomiting, heartburn, abdominal pain, constipation or diarrhea.
Neurologic	- irritability, insomnia, weakness (fatigue), dizziness, loss of memory, confusion, hallucinations, incoordination, ataxia, decreased strength in hands or feet, disturbance in gait, difficulty in climbing stairs, or seizures.
Hematologic	- pallor, easy fatigability, abnormal blood loss, melena.
Reproductive (male or female and spouse where relevant)	- history of infertility, impotence, loss of libido, abnormal menstrual periods, history of miscarriages, stillbirths, or children with birth defects.
Musculoskeletal	- muscle and joint pains.

(G) The physical examination should emphasize the neurological, gastrointestinal, and cardiovascular systems. The worker's weight and blood pressure should be recorded and the oral mucosa checked for pigmentation characteristic of a possible Burtonian or lead line on the gingiva. It should be noted, however, that the lead line may not be present even in severe lead poisoning if good oral hygiene is practiced.

(H) The presence of pallor on skin examination may indicate an anemia, which if severe might also be associated with a tachycardia. If an anemia is suspected, an active search for blood loss should be undertaken including potential blood loss through the gastrointestinal tract.

(I) A complete neurological examination should include an adequate mental status evaluation including a search for behavioral and psychological disturbances, memory testing, evaluation for irritability, insomnia, hallucinations, and mental clouding. Gait and coordination should be examined along with close observation for tremor. A detailed evaluation of peripheral nerve function including careful sensory and

motor function testing is warranted. Strength testing particularly of extensor muscle groups of all extremities is of fundamental importance.

(J) Cranial nerve evaluation should also be included in the routine examination.

(K) The abdominal examination should include auscultation for bowel sounds and abnormal bruits and palpation for organomegaly, masses, and diffuse abdominal tenderness.

(L) Cardiovascular examination should evaluate possible early signs of congestive heart failure. Pulmonary status should be addressed particularly if respirator protection is contemplated.

(M) As part of the medical evaluation, the lead standard requires the following laboratory studies.

(I) Blood lead level.

(II) Hemoglobin and hematocrit determinations, red cell indices, and examination of the peripheral blood smear to evaluate red blood cell morphology.

(III) Blood urea nitrogen.

(IV) Serum creatinine.

(V) Routine urinalysis with microscopic examination.

(VI) A zinc protoporphyrin level.

(N) In addition to the above, the physician is authorized to order any further laboratory or other tests which he or she deems necessary in accordance with sound medical practice. The evaluation must also include pregnancy testing or laboratory evaluation of male fertility if requested by the employee.

(O) Additional tests which are probably not warranted on a routine basis but may be appropriate when blood lead and ZPP levels are equivocal include delta aminolevulinic acid and coproporphyrin concentrations in the urine, and dark-field illumination for detection of basophilic stippling in red blood cells.

(P) If an anemia is detected further studies including a careful examination of the peripheral smear, reticulocyte count, stool for occult blood, serum iron, total iron binding capacity, bilirubin, and, if appropriate vitamin B12 and folate may be of value in attempting to identify the cause of the anemia.

(Q) If a peripheral neuropathy is suspected, nerve conduction studies are warranted both for diagnosis and as a basis to monitor any therapy.

(R) If renal disease is questioned, a 24-hour urine collection for creatinine clearance, protein, and electrolytes may be indicated. Elevated uric acid levels may result from lead-induced renal disease and a serum uric acid level might be performed.

(S) An electrocardiogram and chest x-ray may be obtained as deemed appropriate.

(T) Sophisticated and highly specialized testing should not be done routinely and where indicated should be under the direction of a specialist.

(v) Laboratory evaluation.

(A) The blood level at present remains the single most important test to monitor lead exposure and is the test used in the medical surveillance program under the lead standard to guide employee medical removal. The ZPP has several advantages over the blood lead level. Because of its relatively recent development and the lack of extensive data concerning its interpretation, the ZPP currently remains an ancillary test.

(B) This section will discuss the blood lead level and ZPP in detail and will outline their relative advantages and disadvantages. Other blood tests currently available to evaluate lead exposure will also be reviewed.

(C) The blood lead level is a good index of current or recent lead absorption when there is no anemia present and when the worker has not taken any chelating agents. However, blood lead levels along with urinary lead levels do not necessarily indicate the total body burden of lead and are not adequate measures of past exposure. One reason for this is that lead has a high affinity for bone and up to 90 percent of the body's total lead is deposited there. A very important component of the total lead body burden is lead in soft tissue (liver, kidneys, and brain). This fraction of the lead body burden, the biologically active lead, is not entirely reflected by blood lead levels since it is a function of the dynamics of lead absorption, distribution, deposition in bone and excretion. Following discontinuation of exposure to lead, the excess body burden is only slowly mobilized from bone and other relatively stable stores and excreted. Consequently, a high blood lead level may only represent recent heavy exposure to lead without a significant total body excess and likewise a low blood lead level does not exclude an elevated total body burden of lead.

(D) Also due to its correlation with recent exposures, the blood lead level may vary considerably over short time intervals.

(E) To minimize laboratory error and erroneous results due to contamination, blood specimens must be carefully collected after thorough cleaning of the skin with appropriate methods using lead-free containers and analyzed by a reliable laboratory. Under the standard, samples must be analyzed in laboratories which are approved by the Center for Disease Control (CDC) or which have received satisfactory grades in proficiency testing by the CDC in the previous year. Analysis is to be made using atomic absorption spectrophotometry anodic stripping; voltammetry or any method which meets the accuracy requirements set forth by the standard.

(F) The determination of lead in urine is generally considered a less reliable monitoring technique than analysis of whole blood primarily due to individual variability in urinary excretion capacity as well as the technical difficulty of obtaining accurate 24 hour urine collections. In addition, workers with renal insufficiency, whether due to lead or some other cause, may have decreased lead clearance and consequently urine lead levels may underestimate the true lead burden. Therefore, urine lead levels should not be used as a routine test.

(G) The zinc protoporphyrin test, unlike the blood lead determination, measures an adverse metabolic effect of lead and as such is a better indicator of lead toxicity than the level of blood lead itself. The level of ZPP reflects lead absorption over the preceding three to four months, and therefore is a better indicator of lead body burden. The ZPP requires more time than the blood lead to read significantly elevated levels; the return to normal after discontinuing lead exposure is also slower. Furthermore, the ZPP test is simpler, faster, and less expensive to perform and no contamination is possible. Many investigators believe it is the most reliable means of monitoring chronic lead absorption.

(H) Zinc protoporphyrin results from the inhibition of the enzyme ferrochelatase which catalyzes the insertion of an iron molecule into the protoporphyrin molecule, which then becomes heme. If iron is not inserted into the molecule then zinc, having a greater affinity for protoporphyrin, takes place in the iron, forming ZPP.

(I) An elevation in the level of circulating ZPP may occur at blood lead levels as low as 20-30 $\mu\text{g}/100\text{g}$ in some workers. Once the blood lead level has reached 40 $\mu\text{g}/100\text{g}$ there is more marked rise in the ZPP value from its normal range of less than 100 $\mu\text{g}/100\text{ml}$. Increases in blood lead levels beyond 40 $\mu\text{g}/100\text{g}$ are associated with exponential increases in ZPP.

(J) Whereas blood lead levels fluctuate over short time spans, ZPP levels remain relatively stable. ZPP is measured directly in red blood cells and is present for the cell's entire 120 day lifespan. Therefore, the ZPP level in blood reflects the average ZPP production over the previous three to four months and consequently the average lead exposure during that time interval.

(K) It is recommended that a hematocrit be determined whenever a confirmed ZPP of 50 $\mu\text{g}/100\text{ml}$ whole blood is obtained to rule out a significant underlying anemia. If the ZPP is in excess of 100 $\mu\text{g}/100\text{ml}$ and not associated with abnormal elevations in blood lead levels, the laboratory should be checked to be sure the blood leads were determined using atomic absorption spectrophotometry, anodic stripping voltammetry or any method which meets the accuracy requirements set forth by the standard, by a CDC approved laboratory which is experienced in lead level determinations. Repeat periodic blood lead studies should be obtained in all individuals with elevated ZPP levels to be certain that an associated elevated blood lead level has not been missed due to transient fluctuations in blood leads.

(L) ZPP has characteristic fluorescence spectrum with a peak at 594nm which is detectable with a hematofluorimeter. The hematofluorimeter is accurate and portable and can provide on-site, instantaneous results for workers who can be frequently tested via a finger prick.

(M) However, careful attention must be given to calibration and quality control procedures. Limited data on blood lead - ZPP correlations and the ZPP levels which are associated with the adverse health effects discussed in item (ii) are the major limitations of the test. Also it is difficult to correlate ZPP levels with environmental exposure and there is some variation of response with age and sex. Nevertheless, the ZPP promises to be an important diagnostic test for the early detection of lead toxicity and its value will increase as more data is collected regarding its relationship to other manifestations of lead poisoning.

(N) Levels of delta-aminolevulinic acid (ALA) in the urine are also used as a measure of lead exposure. Increasing concentrations of ALA are believed to result from the inhibition of the enzyme delta-aminolevulinic acid dehydrase (ALA-D). Although the test is relatively easy to perform, inexpensive, and rapid, the disadvantages include variability in results, the necessity to collect a complete 24 hour urine sample which has a specific gravity greater than 1.010, and also the fact that ALA decomposes in the presence of light.

(O) The pattern of porphyrin excretion in the urine can also be helpful in identifying lead intoxication. With lead poisoning, the urine concentrations of coproporphyrins I and II, porphobilinogen and uroporphyrin I rise. The most important increase, however, is that of coproporphyrin III; levels may exceed 5,000 $\mu\text{g}/1$ in the urine in lead poisoned individuals, but its correlation with blood lead levels and ZPP are not as good as those of ALA. Increases in urinary porphyrins are not diagnostic of lead toxicity and may be seen in porphyria, some liver diseases, and in patients with high reticulocyte counts.

(vi) Summary.

(A) The WISHA standard for inorganic lead places significant emphasis on the medical surveillance of all workers exposed to levels of inorganic lead above the action level of 30 $\mu\text{g}/\text{m}^3$ TWA. The physician has a fundamental role in this surveillance program, and in the operation of the medical removal protection program.

(B) Even with adequate worker education on the adverse health effects of lead and appropriate training in work practices, personal hygiene and other control measures, the physician has a primary responsibility for evaluating potential lead toxicity in the worker. It is only through a careful and detailed medical and work history, a complete physical examination and appropriate laboratory testing that an accurate assessment can be made. Many of the adverse health effects of lead toxicity are either irreversible or only partially reversible and therefore early detection of disease is very important.

(C) This document outlines the medical monitoring program as defined by the occupational safety and health standard for inorganic lead. It reviews the adverse health effects of lead poisoning and describes the important elements of the history and physical examinations as they relate to these adverse effects.

(D) It is hoped that this review and discussion will give the physician a better understanding of the WISHA standard with the ultimate goal of protecting the health and well-being of the worker exposed to lead under his or her care.

(d) Appendix D. Recommendations to employers concerning high-risk tasks (nonmandatory).

The department advises employers that the following tasks have a high risk for lead overexposure (this list is not complete; other tasks also can result in lead over-exposure):

- Any open flame operation involving lead-containing solder in a manner producing molten solder, including the manufacture or repair of motor vehicle radiators;
- Sanding, cutting or grinding of lead-containing solder;
- Breaking, recycling or manufacture of lead-containing batteries;
- Casting objects using lead, brass, or lead-containing alloys;
- Where lead-containing coatings or paints are present:
 - abrasive blasting
 - welding
 - cutting
 - torch burning
 - manual demolition of structures
 - manual scraping
 - manual sanding
 - heat gun applications
 - power tool cleaning

- rivet busting
- clean-up activities where dry expendable abrasives are used
- abrasive blasting enclosure movement and removal;
- Spray-painting with lead-containing paint;
- Using lead-containing mortar;
- Lead burning;
- Operation or cleaning of shooting facilities where lead bullets are used;
- Formulation or processing of lead-containing pigments or paints;
- Cutting, burning, or melting of lead-containing materials.

The department recommends that annual blood lead testing be offered to all employees potentially overexposed to lead, including those performing the tasks listed above, regardless of air lead levels. Research has shown that air lead levels often do not accurately predict workers' lead overexposure. The blood lead testing will provide the most information if performed during a period of peak lead exposure.

Employers should be aware that the United States Public Health Service has set a goal of eliminating occupational exposures which result in whole blood lead levels of 25 µg/dl or greater. This goal should guide whether employees' blood lead levels indicate lead overexposure.

If blood lead levels are elevated in an employee performing a task associated with lead overexposure, employers should assess the maintenance and effectiveness of exposure controls, hygiene facilities, respiratory protection program, the employee's work practices and personal hygiene, and the employee's respirator use, if any. If a deficiency exists in any of these areas, the employer should correct the problem.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07521, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 96-09-030, § 296-62-07521, filed 4/10/96, effective 6/1/96; 95-04-078, § 296-62-07521, filed 1/30/95, effective 3/2/95; 91-24-017 (Order 91-07), § 296-62-07521, filed 11/22/91, effective 12/24/91; 90-17-051 (Order 90-10), § 296-62-07521, filed 8/13/90, effective 9/24/90; 90-03-029 (Order 89-20), § 296-62-07521, filed 1/11/90, effective 2/26/90; 88-14-108 (Order 88-11), § 296-62-07521, filed 7/6/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-07521, filed 11/30/83; 82-13-045 (Order 82-22), § 296-62-07521, filed 6/11/82. Formerly WAC 296-62-07349.]

WAC 296-62-07523 Benzene. (1) Scope and application.

(a) This section applies to all occupational exposures to benzene. Chemical Abstracts Service Registry No. 71-43-2, except as provided in (b) and (c) of this subsection.

(b) This section does not apply to:

(i) The storage, transportation, distribution, dispensing, sale or use of gasoline, motor fuels, or other fuels containing benzene subsequent to its final discharge from bulk wholesale storage facilities, except that operations where gasoline or motor fuels are dispensed for more than four hours per day in an indoor location are covered by this section.

(ii) Loading and unloading operations at bulk wholesale storage facilities which use vapor control systems for all loading and unloading operations, except for the provisions of WAC 296-62-054 as incorporated into this section and the emergency provisions of subsections (7) and (9)(d) of this section.

(iii) The storage, transportation, distribution, or sale of benzene or liquid mixtures containing more than 0.1 percent benzene in intact containers or in transportation pipelines while sealed in such a manner as to contain benzene vapors or liquid, except for the provisions of WAC 296-62-054 as incorporated into this section and the emergency provisions of subsections (7) and (9)(d) of this section.

(iv) Containers and pipelines carrying mixtures with less than 0.1 percent benzene and natural gas processing plants processing gas with less than 0.1 percent benzene.

(v) Work operations where the only exposure to benzene is from liquid mixtures containing 0.5 percent or less of benzene by volume, or the vapors released from such liquids until September 12, 1988; work operations where the only exposure to benzene is from liquid mixtures containing 0.3 percent or less of benzene by volume or the vapors released from such liquids from September 12, 1988, to September 12, 1989; and work operations where the only exposure to benzene is from liquid mixtures containing 0.1 percent or less of benzene by volume or the vapors released from such liquids after September 12, 1989; except that tire building machine operators using solvents with more than 0.1 percent benzene are covered by subsection (9) of this section.

(vi) Oil and gas drilling, production, and servicing operations.

(vii) Coke oven batteries.

(c) The cleaning and repair of barges and tankers which have contained benzene are excluded from subsection (6) of this section (Methods of compliance), subsection (5)(a) of this section (General), and subsection (5)(f) of this section (Accuracy of monitoring). Engineering and work practice controls shall be used to keep exposures below 10 ppm unless it is proven to be not feasible.

(2) Definitions.

(a) "Action level" means an airborne concentration of benzene of 0.5 ppm calculated as an 8-hour time-weighted average.

(b) "Authorized person" means any person specifically authorized by the employer whose duties require the person to enter a regulated area, or any person entering such an area as a designated representative of employees for the purpose of exercising the right to observe monitoring and measuring procedures under subsection (5) of this section, or any other person authorized by the Washington Industrial Safety and Health Act (WISHA) or regulations issued under WISHA.

(c) "Benzene" (C₆H₆) (CAS Registry No. 71-43-2) means liquefied or gaseous benzene. It includes benzene contained in liquid mixtures and the benzene vapors released by these liquids. It does not include trace amounts of unreacted benzene contained in solid materials.

(d) "Bulk wholesale storage facility" means a bulk terminal or bulk plant where fuel is stored prior to its delivery to wholesale customers.

(e) "Container" means any barrel, bottle, can, cylinder, drum, reaction vessel, storage tank, or the like, but does not include piping systems.

(f) "Day" means any part of a calendar day.

(g) "Director" means the director of the department of labor and industries, or his/her designated representative.

(h) "Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which may or does result in an unexpected significant release of benzene.

(i) "Employee exposure" means exposure to airborne benzene which would occur if the employee were not using respiratory protective equipment.

(j) "Regulated area" means any area where airborne concentrations of benzene exceed or can reasonably be expected to exceed, the permissible exposure limits, either the 8-hour time-weighted average exposure of 1 ppm or the short-term exposure limit of 5 ppm for fifteen minutes.

(k) "Vapor control system" means any equipment used for containing the total vapors displaced during the loading of gasoline, motor fuel, or other fuel tank trucks and the displacing of these vapors through a vapor processing system or balancing the vapor with the storage tank. This equipment also includes systems containing the vapors displaced from the storage tank during the unloading of the tank truck which balance the vapors back to the tank truck.

(3) Permissible exposure limits (PELs).

(a) Time-weighted average limit (TWA). The employer shall assure that no employee is exposed to an airborne concentration of benzene in excess of one part of benzene per million parts of air (1 ppm) as an 8-hour time-weighted average.

(b) Short-term exposure limit (STEL). The employer shall assure that no employee is exposed to an airborne concentration of benzene in excess of 5 ppm as averaged over any fifteen minute period.

(4) Regulated areas.

(a) The employer shall establish a regulated area wherever the airborne concentration of benzene exceeds or can reasonably be expected to exceed the permissible exposure limits, either the 8-hour time-weighted average exposure of 1 ppm or the short-term exposure limit of 5 ppm for fifteen minutes.

(b) Access to regulated areas shall be limited to authorized persons.

(c) Regulated areas shall be determined from the rest of the workplace in any manner that minimizes the number of employees exposed to benzene within the regulated area.

(5) Exposure monitoring.

(a) General.

(i) Determinations of employee exposure shall be made from breathing zone air samples that are representative of each employee's average exposure to airborne benzene.

(ii) Representative 8-hour TWA employee exposures shall be determined on the basis of one sample or samples representing the full shift exposure for each job classification in each work area.

(iii) Determinations of compliance with the STEL shall be made from fifteen minute employee breathing zone samples measured at operations where there is reason to believe exposures are high, such as where tanks are opened, filled, unloaded, or gauged; where containers or process equipment are opened and where benzene is used for cleaning or as a solvent in an uncontrolled situation. The employer may use objective data, such as measurements from brief period mea-

suring devices, to determine where STEL monitoring is needed.

(iv) Except for initial monitoring as required under (b) of this subsection, where the employer can document that one shift will consistently have higher employee exposures for an operation, the employer shall only be required to determine representative employee exposure for that operation during the shift on which the highest exposure is expected.

(b) Initial monitoring.

(i) Each employer who has a place of employment covered under subsection (1)(a) of this section shall monitor each of these workplaces and work operations to determine accurately the airborne concentrations of benzene to which employees may be exposed.

(ii) The initial monitoring required under (b)(i) of this subsection shall be completed by sixty days after the effective date of this standard or within thirty days of the introduction of benzene into the workplace. Where the employer has monitored within one year prior to the effective date of this standard and the monitoring satisfies all other requirements of this section, the employer may rely on such earlier monitoring results to satisfy the requirements of (b)(i) of this subsection.

(c) Periodic monitoring and monitoring frequency.

(i) If the monitoring required by (b)(i) of this subsection reveals employee exposure at or above the action level but at or below the TWA, the employer shall repeat such monitoring for each such employee at least every year.

(ii) If the monitoring required by (b)(i) of this subsection reveals employee exposure above the TWA, the employer shall repeat such monitoring for each such employee at least every six months.

(iii) The employer may alter the monitoring schedule from every six months to annually for any employee for whom two consecutive measurements taken at least seven days apart indicate that the employee exposure has decreased to the TWA or below, but is at or above the action level.

(iv) Monitoring for the STEL shall be repeated as necessary to evaluate exposures of employees subject to short term exposures.

(d) Termination of monitoring.

(i) If the initial monitoring required by (b)(i) of this subsection reveals employee exposure to be below the action level the employer may discontinue the monitoring for that employee, except as otherwise required by (e) of this subsection.

(ii) If the periodic monitoring required by (c) of this subsection reveals that employee exposures, as indicated by at least two consecutive measurements taken at least seven days apart, are below the action level the employer may discontinue the monitoring for that employee, except as otherwise required by (e) of this subsection.

(e) Additional monitoring.

(i) The employer shall institute the exposure monitoring required under (b) and (c) of this subsection when there has been a change in the production, process, control equipment, personnel, or work practices which may result in new or additional exposures to benzene, or when the employer has any reason to suspect a change which may result in new or additional exposures.

(ii) Whenever spills, leaks, ruptures, or other breakdowns occur that may lead to employee exposure, the employer shall monitor (using area or personal sampling) after the cleanup of the spill or repair of the leak, rupture or other breakdown to ensure that exposures have returned to the level that existed prior to the incident.

(f) Accuracy of monitoring. Monitoring shall be accurate, to a confidence level of ninety-five percent, to within plus or minus twenty-five percent for airborne concentrations of benzene.

(g) Employee notification of monitoring results.

(i) The employer shall, within fifteen working days after the receipt of the results of any monitoring performed under this standard, notify each employee of these results in writing either individually or by posting of results in an appropriate location that is accessible to affected employees.

(ii) Whenever the PELs are exceeded, the written notification required by (g)(i) of this subsection shall contain the corrective action being taken by the employer to reduce the employee exposure to or below the PEL, or shall refer to a document available to the employee which states the corrective actions to be taken.

(6) Methods of compliance.

(a) Engineering controls and work practices.

(i) The employer shall institute engineering controls and work practices to reduce and maintain employee exposure to benzene at or below the permissible exposure limits, except to the extent that the employer can establish that these controls are not feasible or where the provisions of (a)(iii) of this subsection or subsection (7)(a) of this section apply.

(ii) Wherever the feasible engineering controls and work practices which can be instituted are not sufficient to reduce employee exposure to or below the PELs, the employer shall use them to reduce employee exposure to the lowest levels achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of subsection (7) of this section.

(iii) Where the employer can document that benzene is used in a workplace less than a total of thirty days per year, the employer shall use engineering controls, work practice controls or respiratory protection or any combination of these controls to reduce employee exposure to benzene to or below the PELs, except that employers shall use engineering and work practice controls, if feasible, to reduce exposure to or below 10 ppm as an 8-hour TWA.

(b) Compliance program.

(i) When any exposures are over the PEL, the employer shall establish and implement a written program to reduce employee exposure to or below the PEL primarily by means of engineering and work practice controls, as required by (a) of this subsection.

(ii) The written program shall include a schedule for development and implementation of the engineering and work practice controls. These plans shall be reviewed and revised as appropriate based on the most recent exposure monitoring data, to reflect the current status of the program.

(iii) Written compliance programs shall be furnished upon request for examination and copying to the director, affected employees, and designated employee representatives.

(7) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls;

(ii) Work operations for which the employer establishes that compliance with either the TWA or STEL through the use of engineering and work-practice controls is not feasible; for example some maintenance and repair activities, vessel cleaning, or other operations where engineering and work-practice controls are infeasible because exposures are intermittent and limited in duration;

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient, or are not required under subsection (6)(a)(iii) of this section, to reduce exposure to or below the PELs;

(iv) Emergencies.

(b) Respirator program.

(i) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1), 296-62-07131 (4)(b)(i) and (ii), and 296-62-07150 through 296-62-07156).

(ii) For air-purifying respirators, the employer must replace the air-purifying element at the expiration of its service life or at the beginning of each shift in which such elements are used, whichever comes first.

(iii) If NIOSH certifies an air-purifying element with an end-of-service-life indicator for benzene, such an element may be used until the indicator shows no further useful life.

(c) Respirator selection.

(i) The employer must select the appropriate respirator from Table 1 of this section.

(ii) Any employee who cannot use a negative-pressure respirator must be allowed to use a respirator with less breathing resistance, such as a powered air-purifying respirator or supplied-air respirator.

TABLE 1. - RESPIRATORY PROTECTION FOR BENZENE

Airborne concentration of benzene or condition of use		Respirator type	
(a)	Less than or equal to 10 ppm.	(1)	Half-mask air-purifying respirator with organic vapor cartridge.
(b)	Less than or equal to 50 ppm.	(1)	Full facepiece respirator with organic vapor cartridges.
		(1)	Full facepiece gas mask with chin style canister. ¹
(c)	Less than or equal to 100 ppm.	(1)	Full facepiece powered air-purifying respirator with organic vapor canister. ¹
(d)	Less than or equal to 1,000 ppm.	(1)	Supplied air respirator with full facepiece in positive-pressure mode.
(e)	Greater than 1,000 ppm or unknown concentration.	(1)	Self-contained breathing apparatus with full facepiece in positive-pressure mode.
		(2)	Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.

TABLE 1. - RESPIRATORY PROTECTION FOR BENZENE

Airborne concentration of benzene or condition of use	Respirator type
(f) Escape	(1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
(g) Firefighting	(1) Full facepiece self-contained breathing apparatus in positive pressure mode.

¹ Canisters must have a minimum service life of four (4) hours when tested at 150 ppm benzene, at a flow rate of 64 LPM, 25° C, and 85% relative humidity for non-powered air purifying respirators. The flow rate shall be 115 LPM and 170 LPM respectively for tight fitting and loose fitting powered air-purifying respirators.

(8) Protective clothing and equipment. Personal protective clothing and equipment shall be worn where appropriate to prevent eye contact and limit dermal exposure to liquid benzene. Protective clothing and equipment shall be provided by the employer at no cost to the employee and the employer shall assure its use where appropriate. Eye and face protection shall meet the requirements of WAC 296-24-07801.

(9) Medical surveillance.

(a) General.

(i) The employer shall make available a medical surveillance program for employees who are or may be exposed to benzene at or above the action level thirty or more days per year; for employees who are or may be exposed to benzene at or above the PELs ten or more days per year; for employees who have been exposed to more than 10 ppm of benzene for thirty or more days in a year prior to the effective date of the standard when employed by their current employer; and for employees involved in the tire building operations called tire building machine operators, who use solvents containing greater than 0.1 percent benzene.

(ii) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician and that all laboratory tests are conducted by an accredited laboratory.

(iii) The employer shall assure that persons other than licensed physicians who administer the pulmonary function testing required by this section shall complete a training course in spirometry sponsored by an appropriate governmental, academic, or professional institution.

(iv) The employer shall assure that all examinations and procedures are provided without cost to the employee and at a reasonable time and place.

(b) Initial examination.

(i) Within sixty days of the effective date of this standard, or before the time of initial assignment, the employer shall provide each employee covered by (a)(i) of this subsection with a medical examination including the following elements:

(A) A detailed occupational history which includes:

(I) Past work exposure to benzene or any other hematological toxins;

(II) A family history of blood dyscrasias including hematological neoplasms;

(III) A history of blood dyscrasias including genetic hemoglobin abnormalities, bleeding abnormalities, abnormal function of formed blood elements;

- (IV) A history of renal or liver dysfunction;
- (V) A history of medicinal drugs routinely taken;
- (VI) A history of previous exposure to ionizing radiation; and
- (VII) Exposure to marrow toxins outside of the current work situation.

(B) A complete physical examination.

(C) Laboratory tests. A complete blood count including a leukocyte count with differential, a quantitative thrombocyte count, hematocrit, hemoglobin, erythrocyte count and erythrocyte indices (MCV, MCH, MCHC). The results of these tests shall be reviewed by the examining physician.

(D) Additional tests as necessary in the opinion of the examining physician, based on alterations to the components of the blood or other signs which may be related to benzene exposure.

(E) For all workers required to wear respirators for at least thirty days a year, the physical examination shall pay special attention to the cardiopulmonary system and shall include a pulmonary function test.

(ii) No initial medical examination is required to satisfy the requirements of (b)(i) of this subsection if adequate records show that the employee has been examined in accordance with the procedures of (b)(i) of this subsection within the twelve months prior to the effective date of this standard.

(c) Periodic examinations.

(i) The employer shall provide each employee covered under (a)(i) of this subsection with a medical examination annually following the previous examination. These periodic examinations shall include at least the following elements:

(A) A brief history regarding any new exposure to potential marrow toxins, changes in medicinal drug use, and the appearance of physical signs relating to blood disorders;

(B) A complete blood count including a leukocyte count with differential, quantitative thrombocyte count, hemoglobin, hematocrit, erythrocyte count and erythrocyte indices (MCV, MCH, MCHC); and

(C) Appropriate additional tests as necessary, in the opinion of the examining physician, in consequence of alterations in the components of the blood or other signs which may be related to benzene exposure.

(ii) Where the employee develops signs and symptoms commonly associated with toxic exposure to benzene, the employer shall provide the employee with an additional medical examination which shall include those elements considered appropriate by the examining physician.

(iii) For persons required to use respirators for at least thirty days a year, a pulmonary function test shall be performed every three years. A specific evaluation of the cardiopulmonary system shall be made at the time of the pulmonary function test.

(d) Emergency examinations.

(i) In addition to the surveillance required by (a)(i) of this subsection, if an employee is exposed to benzene in an emergency situation, the employer shall have the employee provide a urine sample at the end of the employee's shift and have a urinary phenol test performed on the sample within seventy-two hours. The urine specific gravity shall be corrected to 1.024.

(ii) If the result of the urinary phenol test is below 75 mg phenol/L of urine, no further testing is required.

(iii) If the result of the urinary phenol test is equal to or greater than 75 mg phenol/L of urine, the employer shall provide the employee with a complete blood count including an erythrocyte count, leukocyte count with differential and thrombocyte count at monthly intervals for a duration of three months following the emergency exposure.

(iv) If any of the conditions specified in (e)(i) of this subsection exists, then the further requirements of (e) of this subsection shall be met and the employer shall, in addition, provide the employees with periodic examinations if directed by the physician.

(e) Additional examinations and referrals.

(i) Where the results of the complete blood count required for the initial and periodic examinations indicate any of the following abnormal conditions exist, then the blood count shall be repeated within two weeks.

(A) The hemoglobin level or the hematocrit falls below the normal limit (outside the ninety-five percent confidence interval (C.I.)) as determined by the laboratory for the particular geographic area and/or these indices show a persistent downward trend from the individual's preexposure norms; provided these findings cannot be explained by other medical reasons.

(B) The thrombocyte (platelet) count varies more than twenty percent below the employee's most recent values or falls outside the normal limit (ninety-five percent C.I.) as determined by the laboratory.

(C) The leukocyte count is below 4,000 per mm³ or there is an abnormal differential count.

(ii) If the abnormality persists, the examining physician shall refer the employee to a hematologist or an internist for further evaluation unless the physician has good reason to believe such referral is unnecessary. (See Appendix C for examples of conditions where a referral may be unnecessary.)

(iii) The employer shall provide the hematologist or internist with the information required to be provided to the physician under this subsection and the medical record required to be maintained by subsection (11)(b)(ii) of this section.

(iv) The hematologist's or internist's evaluation shall include a determination as to the need for additional tests, and the employer shall assure that these tests are provided.

(f) Information provided to the physician. The employer shall provide the following information to the examining physician:

(i) A copy of this regulation and its appendices;

(ii) A description of the affected employee's duties as they relate to the employee's exposure;

(iii) The employee's actual or representative exposure level;

(iv) A description of any personal protective equipment used or to be used; and

(v) Information from previous employment-related medical examinations of the affected employee which is not otherwise available to the examining physician.

(g) Physician's written opinions.

(i) For each examination under this section, the employer shall obtain and provide the employee with a copy of the

examining physician's written opinion within fifteen days of the examination. The written opinion shall be limited to the following information:

(A) The occupationally pertinent results of the medical examination and tests;

(B) The physician's opinion concerning whether the employee has any detected medical conditions which would place the employee's health at greater than normal risk of material impairment from exposure to benzene;

(C) The physician's recommended limitations upon the employee's exposure to benzene or upon the employee's use of protective clothing or equipment and respirators.

(D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions resulting from benzene exposure which require further explanation or treatment.

(ii) The written opinion obtained by the employer shall not reveal specific records, findings, and diagnoses that have no bearing on the employee's ability to work in a benzene-exposed workplace.

(h) Medical removal plan.

(i) When a physician makes a referral to a hematologist/internist as required under (e)(ii) of this subsection, the employee shall be removed from areas where exposures may exceed the action level until such time as the physician makes a determination under (h)(ii) of this subsection.

(ii) Following the examination and evaluation by the hematologist/internist, a decision to remove an employee from areas where benzene exposure is above the action level or to allow the employee to return to areas where benzene exposure is above the action level shall be made by the physician in consultation with the hematologist/internist. This decision shall be communicated in writing to the employer and employee. In the case of removal, the physician shall state the required probable duration of removal from occupational exposure to benzene above the action level and the requirements for future medical examinations to review the decision.

(iii) For any employee who is removed pursuant to (h)(ii) of this subsection, the employer shall provide a follow-up examination. The physician, in consultation with the hematologist/internist, shall make a decision within six months of the date the employee was removed as to whether the employee shall be returned to the usual job or whether the employee should be removed permanently.

(iv) Whenever an employee is temporarily removed from benzene exposure pursuant to (h)(i) or (ii) of this subsection, the employer shall transfer the employee to a comparable job for which the employee is qualified (or can be trained for in a short period) and where benzene exposures are as low as possible, but in no event higher than the action level. The employer shall maintain the employee's current wage rate, seniority, and other benefits. If there is no such job available, the employer shall provide medical removal protection benefits until such a job becomes available or for six months, whichever comes first.

(v) Whenever an employee is removed permanently from benzene exposure based on a physician's recommendation pursuant to (h)(iii) of this subsection, the employee shall be given the opportunity to transfer to another position which

is available or later becomes available for which the employee is qualified (or can be trained for in a short period) and where benzene exposures are as low as possible but in no event higher than the action level. The employer shall assure that such employee suffers no reduction in current wage rate, seniority, or other benefits as a result of the transfer.

(i) Medical removal protection benefits.

(i) The employer shall provide to an employee six months of medical removal protection benefits immediately following each occasion an employee is removed from exposure to benzene because of hematological findings pursuant to (h)(i) and (ii) of this subsection, unless the employee has been transferred to a comparable job where benzene exposures are below the action level.

(ii) For the purposes of this section, the requirement that an employer provide medical removal protection benefits means that the employer shall maintain the current wage rate, seniority, and other benefits of an employee as though the employee had not been removed.

(iii) The employer's obligation to provide medical removal protection benefits to a removed employee shall be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program, or from employment with another employer made possible by virtue of the employee's removal.

(10) Communication of benzene hazards to employees.

(a) Signs and labels.

(i) The employer shall post signs at entrances to regulated areas. The signs shall bear the following legend:

DANGER
BENZENE
CANCER HAZARD
FLAMMABLE-NO SMOKING
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

(ii) The employer shall ensure that labels or other appropriate forms of warning are provided for containers of benzene within the workplace. There is no requirement to label pipes. The labels shall comply with the requirements of WAC 296-62-05411 and in addition shall include the following legend:

DANGER
CONTAINS BENZENE
CANCER HAZARD

(b) Material safety data sheets.

(i) Employers shall obtain or develop, and shall provide access to their employees, to a material safety data sheet (MSDS) which addresses benzene and complies with WAC 296-62-054.

(ii) Employers who are manufacturers or importers shall:

(A) Comply with subsection (1) of this section; and

(B) Comply with the requirement in WISHA's hazard communication standard, WAC 296-62-054 (Hazard communication purpose), that they deliver to downstream employers an MSDS which addresses benzene.

(c) Information and training.

(i) The employer shall provide employees with information and training at the time of their initial assignment to a

work area where benzene is present. If exposures are above the action level, employees shall be provided with information and training at least annually thereafter.

(ii) The training program shall be in accordance with the requirements of WAC 296-62-05415 (1) and (2), and shall include specific information on benzene for each category of information included in that section.

(iii) In addition to the information required under WAC 296-62-054, the employer shall:

(A) Provide employees with an explanation of the contents of this section, including Appendices A and B, and indicate to them where the standard is available; and

(B) Describe the medical surveillance program required under subsection (9) of this section, and explain the information contained in Appendix C.

(11) Recordkeeping.

(a) Exposure measurements.

(i) The employer shall establish and maintain an accurate record of all measurements required by subsection (5) of this section, in accordance with WAC 296-62-052.

(ii) This record shall include:

(A) The dates, number, duration, and results of each of the samples taken, including a description of the procedure used to determine representative employee exposures;

(B) A description of the sampling and analytical methods used;

(C) A description of the type of respiratory protective devices worn, if any; and

(D) The name, Social Security number, job classification, and exposure levels of the employee monitored and all other employees whose exposure the measurement is intended to represent.

(iii) The employer shall maintain this record for at least the duration of employment plus thirty years, in accordance with Part B, Access to records, WAC 296-62-052 through 296-62-05223.

(b) Medical surveillance.

(i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance required by subsection (9) of this section, in accordance with WAC 296-62-052.

(ii) This record shall include:

(A) The name and Social Security number of the employee;

(B) The employer's copy of the physician's written opinion on the initial, periodic, and special examinations, including results of medical examinations and all tests, opinions, and recommendations;

(C) Any employee medical complaints related to exposure to benzene;

(D) A copy of the information provided to the physician as required by subsection (9)(f)(ii) through (v) of this section; and

(E) A copy of the employee's medical and work history related to exposure to benzene or any other hematologic toxins.

(iii) The employer shall maintain this record for at least the duration of employment plus thirty years, in accordance with Part B, Access to records, WAC 296-62-052 through 296-62-05223.

(c) Availability.

(i) The employer shall assure that all records required to be maintained by this section shall be made available upon request to the director for examination and copying.

(ii) Employee exposure monitoring records required by this subsection shall be provided upon request for examination and copying to employees, employee representatives, and the director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(iii) Employee medical records required by this subsection shall be provided upon request for examination and copying, to the subject employee, to anyone having the specific written consent of the subject employee, and to the director in accordance with WAC 296-62-052.

(d) Transfer of records.

(i) The employer shall comply with the requirements involving transfer of records set forth in WAC 296-62-05205.

(ii) If the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall notify the director, at least three months prior to disposal, and transmit them to the director if required by the director within that period.

(12) Observation of monitoring.

(a) Employee observation. The employer shall provide affected employees, or their designated representatives, an opportunity to observe the measuring or monitoring of employee exposure to benzene conducted pursuant to subsection (5) of this section.

(b) Observation procedures. When observation of the measuring or monitoring of employee exposure to benzene requires entry into areas where the use of protective clothing and equipment or respirators is required, the employer shall provide the observer with personal protective clothing and equipment or respirators required to be worn by employees working in the area, assure the use of such clothing and equipment or respirators, and require the observer to comply with all other applicable safety and health procedures.

(13) Appendices. The information contained in WAC 296-62-07525, Appendices A, B, C, and D is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligations.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07523, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07523, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07525 Appendix A substance safety data sheet—Benzene. (1) Substance identification.

(a) Substance: Benzene.

(b) Permissible exposure: Except as to the use of gasoline, motor fuels, and other fuels subsequent to discharge from bulk terminals and other exemptions specified in WAC 296-62-07523 (1)(b):

(i) Airborne: The maximum time-weighted average (TWA) exposure limit is one part of benzene vapor per million parts of air (1 ppm) for an eight-hour workday and the maximum short-term exposure limit (STEL) is 5 ppm for any fifteen-minute period.

(ii) Dermal: Eye contact shall be prevented and skin contact with liquid benzene shall be limited.

(c) Appearance and odor: Benzene is a clear, colorless liquid with a pleasant, sweet odor. The odor of benzene does not provide adequate warning of its hazard.

(2) Health hazard data.

(a) Ways in which benzene affects your health. Benzene can affect your health if you inhale it, or if it comes in contact with your skin or eyes. Benzene is also harmful if you happen to swallow it.

(b) Effects of overexposure.

(i) Short-term (acute) overexposure: If you are overexposed to high concentrations of benzene, well above the levels where its odor is first recognizable, you may feel breathless, irritable, euphoric, or giddy; you may experience irritation in eyes, nose, and respiratory tract. You may develop a headache, feel dizzy, nauseated, or intoxicated. Severe exposures may lead to convulsions and loss of consciousness.

(ii) Long-term (chronic) exposure. Repeated or prolonged exposure to benzene, even at relatively low concentrations, may result in various blood disorders, ranging from anemia to leukemia, an irreversible, fatal disease. Many blood disorders associated with benzene exposure may occur without symptoms.

(3) Protective clothing and equipment.

(a) Respirators. Respirators are required for those operations in which engineering controls or work practice controls are not feasible to reduce exposure to the permissible level. However, where employers can document that benzene is present in the workplace less than thirty days a year, respirators may be used in lieu of engineering controls. If respirators are worn, they must have joint Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) seal of approval, and cartridge or canisters must be replaced before the end of their service life, or the end of the shift, whichever occurs first. If you experience difficulty breathing while wearing a respirator, you may request a positive pressure respirator from your employer. You must be thoroughly trained to use the assigned respirator, and the training will be provided by your employer.

(b) Protective clothing. You must wear appropriate protective clothing (such as boots, gloves, sleeves, aprons, etc.,) over any parts of your body that could be exposed to liquid benzene.

(c) Eye and face protection. You must wear splash-proof safety goggles if it is possible that benzene may get into your eyes. In addition, you must wear a face shield if your face could be splashed with benzene liquid.

(4) Emergency and first aid procedures.

(a) Eye and face exposure. If benzene is splashed in your eyes, wash it out immediately with large amounts of water. If irritation persists or vision appears to be affected see a doctor as soon as possible.

(b) Skin exposure. If benzene is spilled on your clothing or skin, remove the contaminated clothing and wash the exposed skin with large amounts of water and soap immediately. Wash contaminated clothing before you wear it again.

(c) Breathing. If you or any other person breathes in large amounts of benzene, get the exposed person to fresh air at once. Apply artificial respiration if breathing has stopped.

Call for medical assistance or a doctor as soon as possible. Never enter any vessel or confined space where the benzene concentration might be high without proper safety equipment and at least one other person present who will stay outside. A life line should be used.

(d) Swallowing. If benzene has been swallowed and the patient is conscious, do not induce vomiting. Call for medical assistance or a doctor immediately.

(5) Medical requirements. If you are exposed to benzene at a concentration at or above 0.5 ppm as an 8-hour time-weighted average, or have been exposed at or above 10 ppm in the past while employed by your current employer, your employer is required to provide a medical examination and history and laboratory tests within sixty days of the effective date of this standard and annually thereafter. These tests shall be provided without cost to you. In addition, if you are accidentally exposed to benzene (either by ingestion, inhalation, or skin/eye contact) under emergency conditions known or suspected to constitute toxic exposure to benzene, your employer is required to make special laboratory tests available to you.

(6) Observation of monitoring. Your employer is required to perform measurements that are representative of your exposure to benzene and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear the protective clothing and equipment.

(7) Access to records. You or your representative are entitled to see the records of measurements of your exposure to benzene upon written request to your employer. Your medical examination records can be furnished to yourself, your physician, or designated representative upon request by you to your employer.

(8) Precautions for safe use, handling, and storage. Benzene liquid is highly flammable. It should be stored in tightly closed containers in a cool, well ventilated area. Benzene vapor may form explosive mixtures in air. All sources of ignition must be controlled. Use nonsparking tools when opening or closing benzene containers. Fire extinguishers, where provided, must be readily available. Know where they are located and how to operate them. Smoking is prohibited in areas where benzene is used or stored. Ask your supervisor where benzene is used in your area and for additional plant safety rules.

[Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07525, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07527 Appendix B substance technical guidelines—Benzene. (1) Physical and chemical data.

(a) Substance identification.

(i) Synonyms: Benzol, benzole, coal naphtha, cyclohexatriene, phene, phenyl hydride, pyrobenzol. (Benzin, petroleum benzin and Benzine do not contain benzene.)

(ii) Formula: C₆H₆ (CAS Registry Number: 71-43-2).

(b) Physical data.

- (i) Boiling point (760 mm Hg): 80.1 C (176 F).
- (ii) Specific gravity (water=1): 0.879.
- (iii) Vapor density (air=1): 2.7.
- (iv) Melting point: 5.5 C (42 F).
- (v) Vapor pressure at 20 C (68 F): 75 mm Hg.
- (vi) Solubility in water: .06%.
- (vii) Evaporation rate (ether=1): 2.8.
- (viii) Appearance and odor: Clear, colorless liquid with a distinctive sweet odor.

(2) Fire, explosion, and reactivity hazard data.

(a) Fire.

- (i) Flash point (closed cup): -11 C (12 F).
- (ii) Autoignition temperature: 580 C (1076 F).
- (iii) Flammable limits in Air. % by volume: Lower: 1.3%, Upper: 7.5%.
- (iv) Extinguishing media: Carbon dioxide, dry chemical, or foam.

(v) Special fire-fighting procedures: Do not use solid stream of water, since stream will scatter and spread fire. Fine water spray can be used to keep fire-exposed containers cool.

(vi) Unusual fire and explosion hazards: Benzene is a flammable liquid. Its vapors can form explosive mixtures. All ignition sources must be controlled when benzene is used, handled, or stored. Where liquid or vapor may be released, such areas shall be considered as hazardous locations. Benzene vapors are heavier than air; thus the vapors may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which benzene is handled.

(vii) Benzene is classified as a 1 B flammable liquid for the purpose of conforming to the requirements of WAC 296-24-330. A concentration exceeding 3,250 ppm is considered a potential fire explosion hazard. Locations where benzene may be present in quantities sufficient to produce explosive or ignitable mixtures are considered Class I Group D for the purposes of conforming to the requirements of WAC 296-24-95613.

(b) Reactivity.

- (i) Conditions contributing to instability: Heat.
- (ii) Incompatibility: Heat and oxidizing materials.
- (iii) Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide).

(3) Spill and leak procedures.

(a) Steps to be taken if the material is released or spilled. As much benzene as possible should be absorbed with suitable materials, such as dry sand or earth; benzene remaining must be flushed with large amounts of water. Do not flush benzene into a confined space, such as a sewer, because of explosion danger. Remove all ignition sources. Ventilate enclosed places.

(b) Waste disposal method. Disposal methods must conform to other jurisdictional regulations. If allowed, benzene may be disposed of:

(i) By absorbing it in dry sand or earth and disposing in a sanitary landfill;

(ii) If small quantities, by removing it to a safe location from buildings or other combustible sources, pouring it in dry sand or earth and cautiously igniting it; and

(iii) If large quantities, by atomizing it in a suitable combustion chamber.

(4) Miscellaneous precautions.

(a) High exposure to benzene can occur when transferring the liquid from one container to another. Such operations should be well ventilated and good work practices must be established to avoid spills.

(b) Use nonsparking tools to open benzene containers which are effectively grounded and bonded prior to opening and pouring.

(c) Employers must advise employees of all plant areas and operations where exposure to benzene could occur. Common operations in which high exposures to benzene may be encountered are: The primary production and utilization of benzene, and transfer of benzene.

[Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07527, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07529 Appendix C medical surveillance guidelines for benzene. (1) Route of entry.

Inhalation; skin absorption.

(2) Toxicology. Benzene is primarily an inhalation hazard. Systemic absorption may cause depression of the hematopoietic system, pancytopenia, aplastic anemia, and leukemia. Inhalation of high concentrations can affect central nervous system function. Aspiration of small amounts of liquid benzene immediately causes pulmonary edema and hemorrhage of pulmonary tissue. There is some absorption through the skin. Absorption may be more rapid in the case of abraded skin, and benzene may be more readily absorbed if it is present in a mixture or as a contaminant in solvents which are readily absorbed. The defatting action of benzene may produce primary irritation due to repeated or prolonged contact with the skin. High concentrations are irritating to the eyes and the mucous membranes of the nose, and respiratory tract.

(3) Signs and symptoms. Direct skin contact with benzene may cause erythema. Repeated or prolonged contact may result in drying, scaling dermatitis, or development of secondary skin infections. In addition, there is benzene absorption through the skin. Local effects of benzene vapor or liquid on the eye are slight. Only at very high concentrations is there any smarting sensation in the eye. Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation, and/or giddiness, followed by a period of depression, drowsiness, or fatigue. A sensation of tightness in the chest accompanied by breathlessness may occur and ultimately the victim may lose consciousness. Tremors, convulsions, and death may follow from respiratory paralysis or circulatory collapse in a few minutes to several hours following severe exposures.

The detrimental effect on the blood-forming system of prolonged exposure to small quantities of benzene vapor is of extreme importance. The hematopoietic system is the chief target for benzene's toxic effects which are manifested by alterations in the levels of formed elements in the peripheral blood. These effects have occurred at concentrations of benzene which may not cause irritation of mucous membranes, or any unpleasant sensory effects. Early signs and symptoms of benzene morbidity are varied, often not readily noticed and nonspecific. Subjective complaints of headache, dizziness, and loss of appetite may precede or follow clinical signs.

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Rapid pulse and low blood pressure, in addition to a physical appearance of anemia, may accompany a subjective complaint of shortness of breath and excessive tiredness. Bleeding from the nose, gums, or mucous membranes, and the development of purpuric spots (small bruises) may occur as the condition progresses. Clinical evidence of leukopenia, anemia, and thrombocytopenia, singly or in combination, has been frequently reported among the first signs.

Bone marrow may appear normal, aplastic, or hyperplastic, and may not, in all situations, correlate with peripheral blood forming tissues. Because of variations in the susceptibility to benzene morbidity, there is no "typical" blood picture. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased and identification or correlation with benzene exposure must be sought out in the occupational history.

(4) Treatment of acute toxic effects. Remove from exposure immediately. Make sure you are adequately protected and do not risk being overcome by fumes. Give oxygen or artificial resuscitation if indicated. Flush eyes, wash skin if contaminated and remove all contaminated clothing. Symptoms of intoxication may persist following severe exposures. Recovery from mild exposures is usually rapid and complete.

(5) Surveillance and preventive considerations.

(a) General. The principal effects of benzene exposure which form the basis for this regulation are pathological changes in the hematopoietic system, reflected by changes in the peripheral blood and manifesting clinically as pancytopenia, aplastic anemia, and leukemia. Consequently, the medical surveillance program is designed to observe, on a regular basis, blood indices for early signs of these effects, and although early signs of leukemia are not usually available, emerging diagnostic technology and innovative regimes make consistent surveillance for leukemia, as well as other hematopoietic effects, essential.

Initial examinations are to be provided within sixty days of the effective date of this standard, or at the time of initial assignment, and periodic examinations annually thereafter.

There are special provisions for medical tests in the event of hematologic abnormalities or for emergency situations.

The blood values which require referral to a hematologist or internist are noted in (b)(i) of this subsection. The standard specifies that blood abnormalities that persist must be referred "unless the physician has good reason to believe such referral is unnecessary" ((b)(i) of this subsection). Examples of conditions that could make a referral unnecessary despite abnormal blood limits are iron or folate deficiency, menorrhagia, or blood loss due to some unrelated medical abnormality.

Symptoms and signs of benzene toxicity can be nonspecific. Only a detailed history and appropriate investigative procedure will enable a physician to rule out or confirm conditions that place the employee at increased risk. To assist the examining physician with regard to which laboratory tests are necessary and when to refer an employee to the specialist, OSHA has established the following guidelines.

(b) Hematology guidelines. A minimum battery of tests is to be performed by strictly standardized methods.

(i) Red cell, white cell, platelet counts, white blood cell differential, hematocrit and red cell indices must be performed by an accredited laboratory. The normal ranges for the red cell and white cell counts are influenced by altitude, race, and sex, and therefore should be determined by the accredited laboratory in the specific area where the tests are performed.

Either a decline from an absolute normal or an individual's baseline to a subnormal value or a rise to a supra-normal value, are indicative of potential toxicity, particularly if all blood parameters decline. The normal total white blood count is approximately 7,200/mm³ plus or minus 3,000. For cigarette smokers the white count may be higher and the upper range may be 2,000 cells higher than normal for the laboratory. In addition, infection, allergies and some drugs may raise the white cell count. The normal platelet count is approximately 250,000 with a range of 140,000 to 400,000. Counts outside this range should be regarded as possible evidence of benzene toxicity.

Certain abnormalities found through routine screening are of greater significance in the benzene-exposed worker and require prompt consultation with a specialist, namely:

(A) Thrombocytopenia.

(B) A trend of decreasing white cell, red cell, or platelet indices in an individual over time is more worrisome than an isolated abnormal finding at one test time. The importance of trend highlights the need to compare an individual's test results to baseline and/or previous periodic tests.

(C) A constellation or pattern of abnormalities in the different blood indices is of more significance than a single abnormality. A low white count not associated with any abnormalities in other cell indices may be a normal statistical variation, whereas if the low white count is accompanied by decreases in the platelet and/or red cell indices, such a pattern is more likely to be associated with benzene toxicity and merits thorough investigation.

Anemia, leukopenia, macrocytosis or an abnormal differential white blood cell count should alert the physician to further investigate and/or refer the patient if repeat tests confirm the abnormalities. If routine screening detects an abnormality, follow-up tests which may be helpful in establishing the etiology of the abnormality are the peripheral blood smear and the reticulocyte count.

The extreme range of normal for reticulocytes is 0.4 to 2.5 percent of the red cells, the usual range being 0.5 to 1.2 percent of the red cells, but the typical value is in the range of 0.8 to 1.0 percent. A decline in reticulocytes to levels of less than 0.4 percent is to be regarded as possible evidence (unless another specific cause is found) of benzene toxicity requiring accelerated surveillance. An increase in reticulocyte levels to about 2.5 percent may also be consistent with (but is not as characteristic of) benzene toxicity.

(ii) An important diagnostic test is a careful examination of the peripheral blood smear. As with reticulocyte count the smear should be with fresh uncoagulated blood obtained from a needle tip following venipuncture or from a drop of earlobe blood (capillary blood). If necessary, the smear may, under certain limited conditions, be made from a blood sample anticoagulated with EDTA (but never with oxalate or heparin). When the smear is to be prepared from a specimen

of venous blood which has been collected by a commercial Vacutainer type tube containing neutral EDTA, the smear should be made as soon as possible after the venesection. A delay of up to twelve hours is permissible between the drawing of the blood specimen into EDTA and the preparation of the smear if the blood is stored at refrigerator (not freezing) temperature.

(iii) The minimum mandatory observations to be made from the smear are:

(A) The differential white blood cell count;

(B) Description of abnormalities in the appearance of red cells; and

(C) Description of any abnormalities in the platelets.

(D) A careful search must be made throughout of every blood smear for immature white cells such as band forms (in more than normal proportion, i.e., over ten percent of the total differential count), any number of metamyelocytes, myelocytes, or myeloblasts. Any nucleate or multinucleated red blood cells should be reported. Large "giant" platelets or fragments of megakaryocytes must be recognized.

An increase in the proportion of band forms among the neutrophilic granulocytes is an abnormality deserving special mention, for it may represent a change which should be considered as an early warning of benzene toxicity in the absence of other causative factors (most commonly infection). Likewise, the appearance of metamyelocytes, in the absence of another probable cause, is to be considered a possible indication of benzene-induced toxicity.

An upward trend in the number of basophils, which normally do not exceed about 2.0 percent of the total white cells, is to be regarded as possible evidence of benzene toxicity. A rise in the eosinophil count is less specific but also may be suspicious of toxicity if it rises above 6.0 percent of the total white count.

The normal range of monocytes is from 2.0 to 8.0 percent of the total white count with an average of about 5.0 percent. About twenty percent of individuals reported to have mild but persisting abnormalities caused by exposure to benzene show a persistent monocytosis. The findings of a monocyte count which persists at more than ten to twelve percent of the normal white cell count (when the total count is normal) or persistence of an absolute monocyte count in excess of 800/mm³ should be regarded as a possible sign of benzene-induced toxicity.

A less frequent but more serious indication of benzene toxicity is the finding in the peripheral blood of the so-called "pseudo" (or acquired) Pelger-Huet anomaly. In this anomaly many, or sometimes the majority, of the neutrophilic granulocytes possess two round nuclear segments—less often one or three round segments—rather than three normally elongated segments. When this anomaly is not hereditary, it is often but not invariably predictive of subsequent leukemia. However, only about two percent of patients who ultimately develop acute myelogenous leukemia show the acquired Pelger-Huet anomaly. Other tests that can be administered to investigate blood abnormalities are discussed below; however, such procedures should be undertaken by the hematologist.

An uncommon sign, which cannot be detected from the smear, but can be elicited by a "sucrose water test" of peripheral blood, is transient paroxysmal nocturnal hemoglobinuria

(PNH), which may first occur insidiously during a period of established aplastic anemia, and may be followed within one to a few years by the appearance of rapidly fatal acute myelogenous leukemia. Clinical detection of PNH, which occurs in only one or two percent of those destined to have acute myelogenous leukemia, may be difficult; if the "sucrose water test" is positive, the somewhat more definitive Ham test, also known as the acid-serum hemolysis test, may provide confirmation.

(E) Individuals documented to have developed acute myelogenous leukemia years after initial exposure to benzene may have progressed through a preliminary phase of hematologic abnormality. In some instances pancytopenia (i.e., a lowering in the counts of all circulating blood cells of bone marrow origin, but not to the extent implied by the term "aplastic anemia") preceded leukemia for many years. Depression of a single blood cell type or platelets may represent a harbinger of aplasia or leukemia. The finding of two or more cytopenias, or pancytopenia in a benzene-exposed individual, must be regarded as highly suspicious of more advanced although still reversible, toxicity. "Pancytopenia" coupled with the appearance of immature cells (myelocytes, myeloblasts, erythroblasts, etc.), with abnormal cells (pseudo Pelger-Huet anomaly, atypical nuclear heterochromatin, etc.), or unexplained elevations of white blood cells must be regarded as evidence of benzene overexposure unless proved otherwise. Many severely aplastic patients manifested the ominous finding of five to ten percent myeloblasts in the marrow, occasional myeloblasts and myelocytes in the blood and twenty to thirty monocytes. It is evident that isolated cytopenias, pancytopenias, and even aplastic anemias induced by benzene may be reversible and complete recovery has been reported on cessation of exposure. However, since any of these abnormalities is serious, the employee must immediately be removed from any possible exposure to benzene vapor. Certain tests may substantiate the employee's prospects for progression or regression. One such test would be an examination of the bone marrow, but the decision to perform a bone marrow aspiration or needle biopsy is made by the hematologist.

The findings of basophilic stippling in circulating red blood cells (usually found in one to five percent of red cells following marrow injury), and detection in the bone marrow of what are termed "ringed sideroblasts" must be taken seriously, as they have been noted in recent years to be premonitory signs of subsequent leukemia.

Recently peroxidase-staining of circulating or marrow neutrophil granulocytes, employing benzidine dihydrochloride, have revealed the disappearance of, or diminution in, peroxidase in a sizable proportion of the granulocytes, and this has been reported as an early sign of leukemia. However, relatively few patients have been studied to date. Granulocyte granules are normally strongly peroxidase positive. A steady decline in leukocyte alkaline phosphatase has also been reported as suggestive of early acute leukemia. Exposure to benzene may cause an early rise in serum iron, often but not always associated with a fall in the reticulocyte count. Thus, serial measurements of serum iron levels may provide a means of determining whether or not there is a trend representing sustained suppression of erythropoiesis.

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Measurement of serum iron, determination of peroxidase and of alkaline phosphatase activity in peripheral granulocytes can be performed in most pathology laboratories. Peroxidase and alkaline phosphatase staining are usually undertaken when the index of suspicion for leukemia is high.

[Statutory Authority: Chapter 49.17 RCW, 88-21-002 (Order 88-23), § 296-62-07529, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07531 Appendix D sampling and analytical methods for benzene monitoring and measurement procedures. Measurements taken for the purpose of determining employee exposure to benzene are best taken so that the representative average eight-hour exposure may be determined from a single eight-hour sample or two four-hour samples. Short-time interval samples (or grab samples) may also be used to determine average exposure level if a minimum of five measurements are taken in a random manner over the eight-hour work shift. Random sampling means that any portion of the work shift has the same chance of being sampled as any other. The arithmetic average of all such random samples taken on one work shift is an estimate of an employee's average level of exposure for that work shift. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee). Sampling and analysis must be performed with procedures meeting the requirements of the standard.

There are a number of methods available for monitoring employee exposures to benzene. The sampling and analysis may be performed by collection of the benzene vapor on charcoal adsorption tubes, with subsequent chemical analysis by gas chromatography. Sampling and analysis may also be performed by portable direct reading instruments, real-time continuous monitoring systems, passive dosimeters or other suitable methods. The employer has the obligation of selecting a monitoring method which meets the accuracy and precision requirements of the standard under his unique field conditions. The standard requires that the method of monitoring must have an accuracy, to a ninety-five percent confidence level, of not less than plus or minus twenty-five percent for concentrations of benzene greater than or equal to 0.5 ppm.

The WISHA laboratory uses NIOSH Method 1500 for evaluation of benzene air concentrations.

(1) WISHA method HYDCB for air samples.

Analyte: Benzene.

Matrix: Air.

Procedure: Adsorption on charcoal, desorption with carbon disulfide, analysis by GC.

Detection limit: 0.04 ppm.

Recommended air volume and sampling rate: 10L at 0.05 to 0.2 L/min.

(a) Principle of the method.

(i) A known volume of air is drawn through a charcoal tube to trap the organic vapors present.

(ii) The charcoal in the tube is transferred to a small, stoppered vial, and the analyte is desorbed with carbon disulfide.

(iii) An aliquot of the desorbed sample is injected into a gas chromatograph.

(iv) The area of the resulting peak is determined and compared with areas obtained from standards.

(b) Advantages and disadvantages of the method.

(i) The sampling device is small, portable, and involves no liquids. Interferences are minimal, and most of those which do occur can be eliminated by altering chromatographic conditions. The samples are analyzed by means of a quick, instrumental method.

(ii) The amount of sample which can be taken is limited by the number of milligrams that the tube will hold before overloading. When the sample value obtained for the backup section of the charcoal tube exceeds twenty-five percent of that found on the front section, the possibility of sample loss exists.

(c) Apparatus.

(i) A calibrated personal sampling pump whose flow can be determined within ± 5 percent at the recommended flow rate.

(ii) Charcoal tubes: Glass with both ends flame sealed, 7 cm long with a 6-mm O.D. and a 4-mm I.D., containing two sections of 20/40 mesh activated charcoal separated by a 2-mm portion of urethane foam. The activated charcoal is prepared from coconut shells and is obtained commercially. The adsorbing section contains 100 mg of charcoal, the back-up section 50 mg. A 3-mm portion of urethane foam is placed between the outlet end of the tube and the back-up section. A plug of silanized glass wool is placed in front of the adsorbing section. The pressure drop across the tube must be less than one inch of mercury at a flow rate of one liter per minute.

(iii) Gas chromatograph equipped with a flame ionization detector.

(iv) Column (10-ft 1/8-in stainless steel) packed with 80/100 Supelcoport coated with twenty percent SP 2100, 0.1 percent CW 1500.

(v) An electronic integrator or some other suitable method for measuring peak area.

(vi) Two-milliliter sample vials with Teflon-lined caps.

(vii) Microliter syringes: 10-microliter 10-uL syringe, and other convenient sizes for making standards, 1-uL syringe for sample injections.

(viii) Pipets: 1.0 mL delivery pipets.

(ix) Volumetric flasks: Convenient sizes for making standard solutions.

(d) Reagents.

(i) Chromatographic quality carbon disulfide (CS₂). Most commercially available carbon disulfide contains a trace of benzene which must be removed. It can be removed with the following procedure:

Heat under reflux for two to three hours, 500 mL of carbon disulfide, 10 mL concentrated sulfuric acid, and five drops of concentrated nitric acid. The benzene is converted to nitrobenzene. The carbon disulfide layer is removed, dried with anhydrous sodium sulfate, and distilled. The recovered carbon disulfide should be benzene free. (It has recently been determined that benzene can also be removed by passing the carbon disulfide through 13x molecular sieve.)

(ii) Benzene, reagent grade.

(iii) p-Cymene, reagent grade, (internal standard).

(iv) Desorbing reagent. The desorbing reagent is prepared by adding 0.05 mL of p-Cymene per milliliter of car-

bon disulfide. (The internal standard offers a convenient means correcting analytical response for slight inconsistencies in the size of sample injections. If the external standard technique is preferred, the internal standard can be eliminated.)

(v) Purified GC grade helium, hydrogen, and air.

(e) Procedure.

(i) Cleaning of equipment. All glassware used for the laboratory analysis should be properly cleaned and free of organics which could interfere in the analysis.

(ii) Calibration of personal pumps. Each pump must be calibrated with a representative charcoal tube in the line.

(iii) Collection and shipping of samples.

(A) Immediately before sampling, break the ends of the tube to provide an opening at least one-half the internal diameter of the tube (2 mm).

(B) The smaller section of the charcoal is used as the backup and should be placed nearest the sampling pump.

(C) The charcoal tube should be placed in a vertical position during sampling to minimize channeling through the charcoal.

(D) Air being sampled should not be passed through any hose or tubing before entering the charcoal tube.

(E) A sample size of ten liters is recommended. Sample at a flow rate of approximately 0.05 to 0.2 liters per minute. The flow rate should be known with an accuracy of at least ± 5 percent.

(F) The charcoal tubes should be capped with the supplied plastic caps immediately after sampling.

(G) Submit at least one blank tube (a charcoal tube subjected to the same handling procedures, without having any air drawn through it) with each set of samples. Take necessary shipping and packing precautions to minimize breakage of samples.

(iv) Analysis of samples.

(A) Preparation of samples. In preparation for analysis, each charcoal tube is scored with a file in front of the first section of charcoal and broken open. The glass wool is removed and discarded. The charcoal in the first (larger) section is transferred to a 2-ml vial. The separating section of foam is removed and discarded; the second section is transferred to another capped vial. These two sections are analyzed separately.

(B) Desorption of samples. Prior to analysis, 1.0 mL of desorbing solution is pipetted into each sample container. The desorbing solution consists of 0.05 uL internal standard per mL of carbon disulfide. The sample vials are capped as soon as the solvent is added. Desorption should be done for thirty minutes with occasional shaking.

(C) GC conditions. Typical operating conditions for the gas chromatograph are:

(I) 30 mL/min (60 psig) helium carrier gas flow.

(II) 30 mL/min (40 psig) hydrogen gas flow to detector.

(III) 240 mL/min (40 psig) air flow to detector.

(IV) 150°C injector temperature.

(V) 250°C detector temperature.

(VI) 100°C column temperature.

(D) Injection size. 1 μ L.

(E) Measurement of area. The peak areas are measured by an electronic integrator or some other suitable form of area measurement.

(F) An internal standard procedure is used. The integrator is calibrated to report results in ppm for a ten liter air sample after correction for desorption efficiency.

(v) Determination of desorption efficiency.

(A) Importance of determination. The desorption efficiency of a particular compound can vary from one laboratory to another and from one lot of chemical to another. Thus, it is necessary to determine, at least once, the percentage of the specific compound that is removed in the desorption process, provided the same batch of charcoal is used.

(B) Procedure for determining desorption efficiency. The reference portion of the charcoal tube is removed. To the remaining portion, amounts representing 0.5X, 1X, and 2X and (X represents target concentration) based on a 10 L air sample are injected into several tubes at each level. Dilutions of benzene with carbon disulfide are made to allow injection of measurable quantities. These tubes are then allowed to equilibrate at least overnight. Following equilibration they are analyzed following the same procedure as the samples. Desorption efficiency is determined by dividing the amount of benzene found by amount spiked on the tube.

(f) Calibration and standards. A series of standards varying in concentration over the range of interest is prepared and analyzed under the same GC conditions that will be used on the samples. A calibration curve is prepared by plotting concentration (mg/mL) versus peak area.

(g) Calculations. Benzene air concentration can be calculated from the following equation:

$$\text{mg/m}^3 = (A)(B)/(C)(D)$$

Where: A=μg/mL benzene, obtained from the calibration curve

B=desorption volume (1 mL)

C=Liters of air sampled

D=desorption efficiency

The concentration in mg/m³ can be converted to ppm (at 25° C and 760 mm) with the following equation:

$$\text{ppm} = (\text{mg/m}^3)(24.46)/(78.11)$$

Where: 24.46=molar volume of an ideal gas

25° C and 760 mm

78.11=molecular weight of benzene

(h) Backup data.

(i) Detection limit-air samples.

The detection limit for the analytical procedure is 1.28 mg with a coefficient of variation of 0.023 at this level. This would be equivalent to an air concentration of 0.04 ppm for a 10 L air sample. This amount provided a chromatographic peak that could be identifiable in the presence of possible interferences. The detection limit data were obtained by making 1 μL injections of a 1.283 μg/mL standard.

Injection	Area Count	
1	655.4	$\bar{X} = 640.2$ SD = 14.9 CV = 0.023
2	617.5	
3	662.0	
4	641.1	
5	636.4	
6	629.2	

(ii) Pooled coefficient of variation-Air Samples. The pooled coefficient of variation for the analytical procedure was determined by 1 uL replicate injections of analytical standards. The standards were 16.04, 32.08, and 64.16 ug/mL, which are equivalent to 0.5, 1.0, and 2.0 ppm for a 10 L air sample respectively.

Injection	Area Counts		
	0.5 ppm	1.0 ppm	2.0 ppm
1	3996.5	8130.2	16481
2	4059.4	8235.6	16493
3	4052.0	8307.9	16535
4	4027.2	8263.2	16609
5	4046.8	8291.1	16552
6	4137.9	8288.8	16618
$\bar{X} =$	4053.3	8254.0	16548.3
SD =	47.2	62.5	57.1
CV =	0.0116	0.0076	0.0034
$\bar{CV} = 0.008$ ...	.....	.....	.....

(iii) Storage data-air samples.

Samples were generated at 1.03 ppm benzene at eighty percent relative humidity, 22° C, and 643 mm. All samples were taken for fifty minutes at 0.2 L/min. Six samples were analyzed immediately and the rest of the samples were divided into two groups by fifteen samples each. One group was stored at refrigerated temperature of -25° C, and the other group was stored at ambient temperature (approximately 23° C). These samples were analyzed over a period of fifteen days. The results are tabulated below.

PERCENT RECOVERY

Day Analyzed	Refrigerated			Ambient		
	0	97.4	98.7	98.9	97.4	98.7	98.9
0	97.1	100.6	100.9	97.1	100.6	100.9
2	95.8	96.4	95.4	95.4	96.6	96.9
5	93.9	93.7	92.4	92.4	94.3	94.1
9	93.6	95.5	94.6	95.2	95.6	96.6
13	94.3	95.3	93.7	91.0	95.0	94.6
15	96.8	95.8	94.2	92.9	96.3	95.9

(iv) Desorption data.

Samples were prepared by injecting liquid benzene onto the A section of charcoal tubes. Samples were prepared that would be equivalent to 0.5, 1.0, and 2.0 ppm for a 10 L air sample.

Sample	0.5 ppm	1.0 ppm	2.0 ppm
1	99.4	98.8	99.5
2	99.5	98.7	99.7
3	99.2	98.6	99.8
4	99.4	99.1	100.0
5	99.2	99.0	99.7
6	99.8	99.1	99.9
$\bar{X} =$	99.4	98.9	99.8
SD =	0.22	0.21	0.18
CV =	0.0022	0.0021	0.0018
$\bar{X} = 99.4$			

(v) Carbon disulfide.

Carbon disulfide from a number of sources was analyzed for benzene contamination. The results are given in the following table. The benzene contaminant can be removed with the procedures given in (d)(i) of this subsection.

SAMPLE	ug Benzene/mL	ppm equivalent (for 10 L air sample)
Aldrich Lot 83017.....	4.20	0.13
Baker Lot 720364.....	1.0†	0.03
Baker Lot 822351.....	1.0†	0.03
Malinkrodt Lot WEMP.....	1.74	0.05
Malinkrodt Lot WHGA.....	5.65	0.18
Treated CS ₂	2.90	0.09

(2) WISHA laboratory method for bulk samples.

Analyte: Benzene.

Matrix: Bulk samples.

Procedure: Bulk samples are analyzed directly by high performance liquid chromatography (HPLC) or by capillary gas chromatography. See laboratory manual for GC procedure.

Detection limits: 0.01% by volume.

(a) Principle of the method.

(i) An aliquot of the bulk sample to be analyzed is injected into a liquid chromatograph or gas chromatograph.

(ii) The peak area for benzene is determined and compared to areas obtained from standards.

(b) Advantages and disadvantages of the method.

(i) The analytical procedure is quick, sensitive, and reproducible.

(ii) Reanalysis of samples is possible.

(iii) Interferences can be circumvented by proper selection of HPLC parameters or GC parameters.

(iv) Samples must be free of any particulates that may clog the capillary tubing in the liquid chromatograph. This may require distilling the sample or clarifying with a clarification kit.

(c) Apparatus.

(i) Liquid chromatograph equipped with a UV detector or capillary gas chromatograph with FID detector.

(ii) HPLC column that will separate benzene from other components in the bulk sample being analyzed. The column used for validation studies was a Waters uBondapak C18, 30 cm x 3.9 mm.

(iii) A clarification kit to remove any particulates in the bulk if necessary.

(iv) A micro-distillation apparatus to distill any samples if necessary.

(v) An electronic integrator or some other suitable method of measuring peak areas.

(vi) Microliter syringes-10 uL syringe and other convenient sizes for making standards. 10 uL syringe for sample injections.

(vii) Volumetric flasks, 5 mL and other convenient sizes for preparing standards and making dilutions.

(d) Reagents.

(i) Benzene, reagent grade.

(ii) HPLC grade water, methyl alcohol, and isopropyl alcohol.

(e) Collection and shipment of samples.

(i) Samples should be transported in glass containers with Teflon-lined caps.

(ii) Samples should not be put in the same container used for air samples.

(f) Analysis of samples.

(i) Sample preparation.

If necessary, the samples are distilled or clarified. Samples are analyzed undiluted. If the benzene concentration is out of the working range, suitable dilutions are made with isopropyl alcohol.

(ii) HPLC conditions.

The typical operating conditions for the high performance liquid chromatograph are:

(A) Mobile phase-Methyl alcohol/water, 50/50.

(B) Analytical wavelength-254 nm.

(C) Injection size-10 µL.

(iii) Measurement of peak area and calibration.

Peak areas are measured by an integrator or other suitable means. The integrator is calibrated to report results % in benzene by volume.

(g) Calculations.

Since the integrator is programmed to report results in % benzene by volume in an undiluted sample, the following equation is used:

% Benzene by Volume=A x B

Where: A=% by volume on report

B=Dilution Factor

(B=1 for undiluted sample)

(h) Backup data.

(i) Detection limit-bulk samples.

The detection limit for the analytical procedure for bulk samples is 0.88 ug, with a coefficient of variation of 0.019 at this level. This amount provided a chromatographic peak that could be identifiable in the presence of possible interferences. The detection limit data were obtained by making 10 uL injections of a 0.10% by volume standard.

1	45386	
2	44214	
3	43822	$\bar{X} = 44040.1$
4	44062	SD = 852.5
6	42724	CV = 0.019

(ii) Pooled coefficient of variation-bulk samples.

The pooled coefficient of variation for analytical procedure was determined by 50 uL replicate injections of analytical standards. The standards were 0.01, 0.02, 0.04, 0.10, 1.0, and 2.0% benzene by volume.

Injection No.	0.01	0.02	0.04	0.10	1.0	2.0
1	45386	84737	166097	448497	4395380	9339150
2	44241	84300	170832	441299	4590800	9484900
3	43822	83835	164160	443719	4593200	9557580
4	44062	84381	164445	444842	4642350	9677060
5	44006	83012	168398	442564	4646430	9766240
6	42724	81957	173002	443975	4646260	.....
\bar{X} =	44040.1	83703.6	167872	444149	4585767	9564986
SD =	852.5	1042.2	3589.8	2459.1	96839.3	166233
CV =	0.0194	0.0125	0.0213	0.0055	0.0211	0.0174
\overline{CV} =	0.017					

[Statutory Authority: Chapter 49.17 RCW. 90-09-026 (Order 90-01), § 296-62-07531, filed 4/10/90, effective 5/25/90; 89-11-035 (Order 89-03), § 296-62-07531, filed 5/15/89, effective 6/30/89; 88-21-002 (Order 88-23), § 296-62-07531, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07540 Formaldehyde. (1) Scope and application. This standard applies to all occupational exposures to formaldehyde, i.e., from formaldehyde gas, its solutions, and materials that release formaldehyde.

(2) Definitions. For purposes of this standard, the following definitions shall apply:

(a) "Action level" means a concentration of 0.5 part formaldehyde per million parts of air (0.5 ppm) calculated as an 8-hour time-weighted average (TWA) concentration.

(b) "Approved" means approved by the director of the department of labor and industries or his/her authorized representative: Provided, however, That should a provision of this chapter state that approval by an agency or organization other than the department of labor and industries is required, such as Underwriters' Laboratories or the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health, the provision of WAC 296-24-006 shall apply.

(c) "Authorized person" means any person required by work duties to be present in regulated work areas, or authorized to do so by the employer, by this section of the standard, or by the WISHA Act.

(d) "Director" means the director of the department of labor and industries, or his/her designated representative.

(e) "Emergency" is any occurrence, such as but not limited to equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled release of a significant amount of formaldehyde.

(f) "Employee exposure" means the exposure to airborne formaldehyde which would occur without corrections for protection provided by any respirator that is in use.

(g) "Formaldehyde" means the chemical substance, HCHO, Chemical Abstracts Service Registry No. 50-00-0.

(3) Permissible exposure limit (PEL).

(a) TWA: The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds 0.75 part formaldehyde per million parts of air as an 8-hour TWA.

(b) Short term exposure limit (STEL): The employer shall assure that no employee is exposed to an airborne concentration of formaldehyde which exceeds two parts formaldehyde per million parts of air (2 ppm) as a fifteen-minute STEL.

(4) Exposure monitoring.

(a) General.

(i) Each employer who has a workplace covered by this standard shall monitor employees to determine their exposure to formaldehyde.

(ii) Exception. Where the employer documents, using objective data, that the presence of formaldehyde or formaldehyde-releasing products in the workplace cannot result in airborne concentrations of formaldehyde that would cause any employee to be exposed at or above the action level or the STEL under foreseeable conditions of use, the employer will not be required to measure employee exposure to formaldehyde.

(iii) When an employee's exposure is determined from representative sampling, the measurements used shall be representative of the employee's full shift or short-term exposure to formaldehyde, as appropriate.

(iv) Representative samples for each job classification in each work area shall be taken for each shift unless the employer can document with objective data that exposure levels for a given job classification are equivalent for different workshifts.

(b) Initial monitoring. The employer shall identify all employees who may be exposed at or above the action level or at or above the STEL and accurately determine the exposure of each employee so identified.

(i) Unless the employer chooses to measure the exposure of each employee potentially exposed to formaldehyde, the employer shall develop a representative sampling strategy and measure sufficient exposures within each job classification for each workshift to correctly characterize and not underestimate the exposure of any employee within each exposure group.

(ii) The initial monitoring process shall be repeated each time there is a change in production, equipment, process, personnel, or control measures which may result in new or additional exposure to formaldehyde.

(iii) If the employer receives reports or signs or symptoms of respiratory or dermal conditions associated with formaldehyde exposure, the employer shall promptly monitor the affected employee's exposure.

(c) Periodic monitoring.

(i) The employer shall periodically measure and accurately determine exposure to formaldehyde for employees shown by the initial monitoring to be exposed at or above the action level or at or above the STEL.

(ii) If the last monitoring results reveal employee exposure at or above the action level, the employer shall repeat monitoring of the employees at least every six months.

(iii) If the last monitoring results reveal employee exposure at or above the STEL, the employer shall repeat monitoring of the employees at least once a year under worst conditions.

(d) Termination of monitoring. The employer may discontinue periodic monitoring for employees if results from two consecutive sampling periods taken at least seven days apart show that employee exposure is below the action level and the STEL. The results must be statistically representative and consistent with the employer's knowledge of the job and work operation.

(e) Accuracy of monitoring. Monitoring shall be accurate, at the ninety-five percent confidence level, to within plus or minus twenty-five percent for airborne concentrations of formaldehyde at the TWA and the STEL and to within plus or minus thirty-five percent for airborne concentrations of formaldehyde at the action level.

(f) Employee notification of monitoring results. Within fifteen days of receiving the results of exposure monitoring conducted under this standard, the employer shall notify the affected employees of these results. Notification shall be in writing, either by distributing copies of the results to the employees or by posting the results. If the employee exposure is over either PEL, the employer shall develop and implement a written plan to reduce employee exposure to or below both PELs, and give written notice to employees. The written notice shall contain a description of the corrective action being taken by the employer to decrease exposure.

(g) Observation of monitoring.

(i) The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to formaldehyde required by this standard.

(ii) When observation of the monitoring of employee exposure to formaldehyde requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the clothing and equipment to the observer, require the observer to use such clothing and equipment, and assure that the observer complies with all other applicable safety and health procedures.

(5) Regulated areas.

(a) The employer shall establish regulated areas where the concentration of airborne formaldehyde exceeds either the TWA or the STEL and post all entrances and accessways with signs bearing the following information:

DANGER
FORMALDEHYDE
IRRITANT AND POTENTIAL CANCER HAZARD
AUTHORIZED PERSONNEL ONLY

(b) The employer shall limit access to regulated areas to authorized persons who have been trained to recognize the hazards of formaldehyde.

(c) An employer at a multi-employer worksite who establishes a regulated area shall communicate the access restrictions and locations of these areas to other employers with work operations at that worksite.

(6) Methods of compliance.

(a) Engineering controls and work practices. The employer shall institute engineering and work practice controls to reduce and maintain employee exposures to formaldehyde at or below the TWA and the STEL.

(b) Exception. Whenever the employer has established that feasible engineering and work practice controls cannot reduce employee exposure to or below either of the PELs, the employer shall apply these controls to reduce employee exposures to the extent feasible and shall supplement them with respirators which satisfy this standard.

(7) Respiratory protection.

(a) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls;

(ii) Work operations, such as maintenance and repair activities or vessel cleaning, for which the employer establishes that engineering and work-practice controls are not feasible;

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce exposure to or below the PELs;

(iv) Emergencies.

(b) Respirator program.

(i) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1), 296-62-07131 (4)(b)(i) and (ii), and 296-62-07150 through 296-62-07156).

(ii) If air-purifying chemical-cartridge respirators are used, the employer must:

(A) Replace the cartridge after three hours of use or at the end of the workshift, whichever occurs first, unless the cartridge contains a NIOSH-certified end-of-service-life indicator (ESLI) to show when breakthrough occurs.

(B) Unless the canister contains a NIOSH-certified ESLI to show when breakthrough occurs, replace canisters used in atmospheres up to 7.5 ppm (10 x PEL) every four hours and industrial-sized canisters used in atmospheres up to 75 ppm (100 x PEL) every two hours, or at the end of the workshift, whichever occurs first.

(c) Respirator selection.

(i) The employer must select appropriate respirators from Table 1 of this section.

TABLE 1
MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION
AGAINST FORMALDEHYDE

Condition of use or formaldehyde concentration (ppm)	Minimum respirator required ¹
Up to 7.5 ppm (10 x PEL)	Full facepiece with cartridges or canisters specifically approved for protection against formaldehyde ² .

TABLE 1
MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION
AGAINST FORMALDEHYDE

Up to 75 ppm (100 x PEL)	Full-face mask with chin style or chest or back mounted type industrial size canister specifically approved for protection against formaldehyde. Type C supplied-air respirator pressure demand or continuous flow type, with full facepiece, hood, or helmet.
Above 75 ppm or unknown (emergencies) (100 x PEL)	Self-contained breathing apparatus (SCBA) with positive-pressure full facepiece. Combination supplied-air, full face-piece positive-pressure respirator with auxiliary self-contained air supply.
Fire fighting	SCBA with positive-pressure in full facepiece.
Escape	SCBA in demand or pressure demand mode. Full-face mask with chin style or front or back mounted type industrial size canister specifically approved for protection against formaldehyde.

¹ Respirators specified for use at higher concentrations may be used at lower concentrations.

² A half-mask respirator with cartridges specifically approved for protection against formaldehyde can be substituted for the full facepiece respirator providing that effective gas-proof goggles are provided and used in combination with the half-mask respirator.

(ii) The employer must provide a powered air-purifying respirator adequate to protect against formaldehyde exposure to any employee who has difficulty using a negative-pressure respirator.

(8) Protective equipment and clothing. Employers shall comply with the provisions of WAC 296-24-07501 and 296-24-07801. When protective equipment or clothing is provided under these provisions, the employer shall provide these protective devices at no cost to the employee and assure that the employee wears them.

(a) Selection. The employer shall select protective clothing and equipment based upon the form of formaldehyde to be encountered, the conditions of use, and the hazard to be prevented.

(i) All contact of the eyes and skin with liquids containing one percent or more formaldehyde shall be prevented by the use of chemical protective clothing made of material impervious to formaldehyde and the use of other personal protective equipment, such as goggles and face shields, as appropriate to the operation.

(ii) Contact with irritating or sensitizing materials shall be prevented to the extent necessary to eliminate the hazard.

(iii) Where a face shield is worn, chemical safety goggles are also required if there is a danger of formaldehyde reaching the area of the eye.

(iv) Full body protection shall be worn for entry into areas where concentrations exceed 100 ppm and for emergency reentry into areas of unknown concentration.

(b) Maintenance of protective equipment and clothing.

(i) The employer shall assure that protective equipment and clothing that has become contaminated with formaldehyde is cleaned or laundered before its reuse.

(ii) When ventilating formaldehyde-contaminated clothing and equipment, the employer shall establish a storage area so that employee exposure is minimized. Containers for contaminated clothing and equipment and storage areas shall have labels and signs containing the following information:

DANGER

FORMALDEHYDE-CONTAMINATED (CLOTHING) EQUIPMENT

AVOID INHALATION AND SKIN CONTACT

(iii) The employer shall assure that only persons trained to recognize the hazards of formaldehyde remove the contaminated material from the storage area for purposes of cleaning, laundering, or disposal.

(iv) The employer shall assure that no employee takes home equipment or clothing that is contaminated with formaldehyde.

(v) The employer shall repair or replace all required protective clothing and equipment for each affected employee as necessary to assure its effectiveness.

(vi) The employer shall inform any person who launders, cleans, or repairs such clothing or equipment of formaldehyde's potentially harmful effects and of procedures to safely handle the clothing and equipment.

(9) Hygiene protection.

(a) The employer shall provide change rooms, as described in WAC 296-24-120 for employees who are required to change from work clothing into protective clothing to prevent skin contact with formaldehyde.

(b) If employees' skin may become splashed with solutions containing one percent or greater formaldehyde, for example because of equipment failure or improper work practices, the employer shall provide conveniently located quick drench showers and assure that affected employees use these facilities immediately.

(c) If there is any possibility that an employee's eyes may be splashed with solutions containing 0.1 percent or greater formaldehyde, the employer shall provide acceptable eye-wash facilities within the immediate work area for emergency use.

(10) Housekeeping. For operations involving formaldehyde liquids or gas, the employer shall conduct a program to detect leaks and spills, including regular visual inspections.

(a) Preventative maintenance of equipment, including surveys for leaks, shall be undertaken at regular intervals.

(b) In work areas where spillage may occur, the employer shall make provisions to contain the spill, to decontaminate the work area, and to dispose of the waste.

(c) The employer shall assure that all leaks are repaired and spills are cleaned promptly by employees wearing suitable protective equipment and trained in proper methods for cleanup and decontamination.

(d) Formaldehyde-contaminated waste and debris resulting from leaks or spills shall be placed for disposal in sealed containers bearing a label warning of formaldehyde's presence and of the hazards associated with formaldehyde.

(11) Emergencies. For each workplace where there is the possibility of an emergency involving formaldehyde, the employer shall assure appropriate procedures are adopted to

minimize injury and loss of life. Appropriate procedures shall be implemented in the event of an emergency.

(12) Medical surveillance.

(a) Employees covered.

(i) The employer shall institute medical surveillance programs for all employees exposed to formaldehyde at concentrations at or exceeding the action level or exceeding the STEL.

(ii) The employer shall make medical surveillance available for employees who develop signs and symptoms of overexposure to formaldehyde and for all employees exposed to formaldehyde in emergencies. When determining whether an employee may be experiencing signs and symptoms of possible overexposure to formaldehyde, the employer may rely on the evidence that signs and symptoms associated with formaldehyde exposure will occur only in exceptional circumstances when airborne exposure is less than 0.1 ppm and when formaldehyde is present in materials in concentrations less than 0.1 percent.

(b) Examination by a physician. All medical procedures, including administration of medical disease questionnaires, shall be performed by or under the supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(c) Medical disease questionnaire. The employer shall make the following medical surveillance available to employees prior to assignment to a job where formaldehyde exposure is at or above the action level or above the STEL and annually thereafter. The employer shall also make the following medical surveillance available promptly upon determining that an employee is experiencing signs and symptoms indicative of possible overexposure to formaldehyde.

(i) Administration of a medical disease questionnaire, such as in Appendix D, which is designed to elicit information on work history, smoking history, any evidence of eye, nose, or throat irritation; chronic airway problems or hyperreactive airway disease; allergic skin conditions or dermatitis; and upper or lower respiratory problems.

(ii) A determination by the physician, based on evaluation of the medical disease questionnaire, of whether a medical examination is necessary for employees not required to wear respirators to reduce exposure to formaldehyde.

(d) Medical examinations. Medical examinations shall be given to any employee who the physician feels, based on information in the medical disease questionnaire, may be at increased risk from exposure to formaldehyde and at the time of initial assignment and at least annually thereafter to all employees required to wear a respirator to reduce exposure to formaldehyde. The medical examination shall include:

(i) A physical examination with emphasis on evidence of irritation or sensitization of the skin and respiratory system, shortness of breath, or irritation of the eyes.

(ii) Laboratory examinations for respirator wearers consisting of baseline and annual pulmonary function tests. As a minimum, these tests shall consist of forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and forced expiratory flow (FEF).

(iii) Any other test which the examining physician deems necessary to complete the written opinion.

(iv) Counseling of employees having medical conditions that would be directly or indirectly aggravated by exposure to formaldehyde on the increased risk of impairment of their health.

(e) Examinations for employees exposed in an emergency. The employer shall make medical examinations available as soon as possible to all employees who have been exposed to formaldehyde in an emergency.

(i) The examination shall include a medical and work history with emphasis on any evidence of upper or lower respiratory problems, allergic conditions, skin reaction or hypersensitivity, and any evidence of eye, nose, or throat irritation.

(ii) Other examinations shall consist of those elements considered appropriate by the examining physician.

(f) Information provided to the physician. The employer shall provide the following information to the examining physician:

(i) A copy of this standard and Appendices A, C, D, and E;

(ii) A description of the affected employee's job duties as they relate to the employee's exposure to formaldehyde;

(iii) The representative exposure level for the employee's job assignment;

(iv) Information concerning any personal protective equipment and respiratory protection used or to be used by the employee; and

(v) Information from previous medical examinations of the affected employee within the control of the employer.

(vi) In the event of a nonroutine examination because of an emergency, the employer shall provide to the physician as soon as possible: A description of how the emergency occurred and the exposure the victim may have received.

(g) Physician's written opinion.

(i) For each examination required under this standard, the employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination except that it shall not reveal specific findings or diagnoses unrelated to occupational exposure to formaldehyde. The written opinion shall include:

(A) The physician's opinion as to whether the employee has any medical condition that would place the employee at an increased risk of material impairment of health from exposure to formaldehyde;

(B) Any recommended limitations on the employee's exposure or changes in the use of personal protective equipment, including respirators;

(C) A statement that the employee has been informed by the physician of any medical conditions which would be aggravated by exposure to formaldehyde, whether these conditions may have resulted from past formaldehyde exposure or from exposure in an emergency, and whether there is a need for further examination or treatment.

(ii) The employer shall provide for retention of the results of the medical examination and tests conducted by the physician.

(iii) The employer shall provide a copy of the physician's written opinion to the affected employee within fifteen days of its receipt.

(h) Medical removal.

(i) The provisions of this subdivision apply when an employee reports significant irritation of the mucosa of the eyes or of the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization attributed to workplace formaldehyde exposure. Medical removal provisions do not apply in case of dermal irritation or dermal sensitization when the product suspected of causing the dermal condition contains less than 0.05% formaldehyde.

(ii) An employee's report of signs or symptoms of possible overexposure to formaldehyde shall be evaluated by a physician selected by the employer pursuant to (c) of this subsection. If the physician determines that a medical examination is not necessary under (c)(ii) of this subsection, there shall be a two-week evaluation and remediation period to permit the employer to ascertain whether the signs or symptoms subside untreated or with the use of creams, gloves, first aid treatment, or personal protective equipment. Industrial hygiene measures that limit the employee's exposure to formaldehyde may also be implemented during this period. The employee shall be referred immediately to a physician prior to expiration of the two-week period if the signs or symptoms worsen. Earnings, seniority, and benefits may not be altered during the two-week period by virtue of the report.

(iii) If the signs or symptoms have not subsided or been remedied by the end of the two-week period, or earlier if signs or symptoms warrant, the employee shall be examined by a physician selected by the employer. The physician shall presume, absent contrary evidence, that observed dermal irritation or dermal sensitization are not attributable to formaldehyde when products to which the affected employee is exposed contain less than 0.1% formaldehyde.

(iv) Medical examinations shall be conducted in compliance with the requirements of (e)(i) and (ii) of this subsection. Additional guidelines for conducting medical exams are contained in WAC 296-62-07546, Appendix C.

(v) If the physician finds that significant irritation of the mucosa of the eyes or the upper airways, respiratory sensitization, dermal irritation, or dermal sensitization result from workplace formaldehyde exposure and recommends restrictions or removal. The employer shall promptly comply with the restrictions or recommendations of removal. In the event of a recommendation of removal, the employer shall remove the affected employee from the current formaldehyde exposure and if possible, transfer the employee to work having no or significantly less exposure to formaldehyde.

(vi) When an employee is removed pursuant to item (v) of this subdivision, the employer shall transfer the employee to comparable work for which the employee is qualified or can be trained in a short period (up to six months), where the formaldehyde exposures are as low as possible, but not higher than the action level. The employer shall maintain the employee's current earnings, seniority, and other benefits. If there is no such work available, the employer shall maintain the employee's current earnings, seniority, and other benefits until such work becomes available, until the employee is determined to be unable to return to workplace formaldehyde exposure, until the employee is determined to be able to return to the original job status, or for six months, whichever comes first.

(vii) The employer shall arrange for a follow-up medical examination to take place within six months after the employee is removed pursuant to this subsection. This examination shall determine if the employee can return to the original job status, or if the removal is to be permanent. The physician shall make a decision within six months of the date the employee was removed as to whether the employee can be returned to the original job status, or if the removal is to be permanent.

(viii) An employer's obligation to provide earnings, seniority, and other benefits to a removed employee may be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program or from employment with another employer made possible by virtue of the employee's removal.

(ix) In making determinations of the formaldehyde content of materials under this subsection the employer may rely on objective data.

(i) Multiple physician review.

(i) After the employer selects the initial physician who conducts any medical examination or consultation to determine whether medical removal or restriction is appropriate, the employee may designate a second physician to review any findings, determinations, or recommendations of the initial physician and to conduct such examinations, consultations, and laboratory tests as the second physician deems necessary and appropriate to evaluate the effects of formaldehyde exposure and to facilitate this review.

(ii) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation for the purpose of medical removal or restriction.

(iii) The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen days after receipt of the notification of the right to seek a second medical opinion, or receipt of the initial physician's written opinion, whichever is later:

(A) The employee informs the employer of the intention to seek a second medical opinion; and

(B) The employee initiates steps to make an appointment with a second physician.

(iv) If the findings, determinations, or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve the disagreement. If the two physicians are unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician who shall be a specialist in the field at issue:

(A) To review the findings, determinations, or recommendations of the prior physicians; and

(B) To conduct such examinations, consultations, laboratory tests, and discussions with prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

(v) In the alternative, the employer and the employee or authorized employee representative may jointly designate such third physician.

(vi) The employer shall act consistent with the findings, determinations, and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(13) Hazard communication.

(a) General. Notwithstanding any exemption granted in WAC 296-62-05403 (6)(c) for wood products, each employer who has a workplace covered by this standard shall comply with the requirements of WAC 296-62-05409 through 296-62-05419. The definitions of the hazard communication standard shall apply under this standard.

(i) The following shall be subject to the hazard communication requirements of this section: Formaldehyde gas, all mixtures or solutions composed of greater than 0.1 percent formaldehyde, and materials capable of releasing formaldehyde into the air under reasonably foreseeable concentrations reaching or exceeding 0.1 ppm.

(ii) As a minimum, specific health hazards that the employer shall address are: Cancer, irritation and sensitization of the skin and respiratory system, eye and throat irritation, and acute toxicity.

(b) Manufacturers and importers who produce or import formaldehyde or formaldehyde-containing products shall provide downstream employers using or handling these products with an objective determination through the required labels and MSDSs if these items may constitute a health hazard within the meaning of WAC 296-62-05407 under normal conditions of use.

(c) Labels.

(i) The employer shall assure that hazard warning labels complying with the requirements of WAC 296-62-05411 are affixed to all containers of materials listed in (a)(i) of this subsection, except to the extent that (a)(i) of this subsection is inconsistent with this item.

(ii) Information on labels. As a minimum, for all materials listed in (a)(i) of this subsection, capable of releasing formaldehyde at levels of 0.1 ppm to 0.5 ppm, labels shall identify that the product contains formaldehyde: List the name and address of the responsible party; and state that physical and health hazard information is readily available from the employer and from material safety data sheets.

(iii) For materials listed in (a)(i) of this subsection, capable of releasing formaldehyde at levels above 0.5 ppm, labels shall appropriately address all the hazards as defined in Part C, WAC 296-62-054 through 296-62-05425, and Appendices A and B, including respiratory sensitization, and shall contain the words "Potential Cancer Hazard."

(iv) In making the determinations of anticipated levels of formaldehyde release, the employer may rely on objective data indicating the extent of potential formaldehyde release under reasonably foreseeable conditions of use.

(v) Substitute warning labels. The employer may use warning labels required by other statutes, regulations, or ordinances which impart the same information as the warning statements required by this subitem.

(d) Material safety data sheets.

(i) Any employer who uses formaldehyde-containing materials listed in (a)(i) of this subsection shall comply with the requirements of WAC 296-62-05413 with regard to the development and updating of material safety data sheets.

(ii) Manufacturers, importers, and distributors of formaldehyde containing materials listed in (a)(i) of this subsection shall assure that material safety data sheets and updated information are provided to all employers purchasing such materials at the time of the initial shipment and at the time of the first shipment after a material safety data sheet is updated.

(e) Written hazard communication program. The employer shall develop, implement, and maintain at the workplace, a written hazard communication program for formaldehyde exposures in the workplace, which at a minimum describes how the requirements specified in this section for labels and other forms of warning and material safety data sheets, and subsection (14) of this section for employee information and training, will be met. Employees in multi-employer workplaces shall comply with the requirements of WAC 296-62-05409 (2)(b).

(14) Employee information and training.

(a) Participation. The employer shall assure that all employees who are assigned to workplaces where there is a health hazard from formaldehyde participate in a training program, except that where the employer can show, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm, the employer is not required to provide training.

(b) Frequency. Employers shall provide such information and training to employees at the time of their initial assignment and whenever a new exposure to formaldehyde is introduced into their work area. The training shall be repeated at least annually.

(c) Training program. The training program shall be conducted in a manner which the employee is able to understand and shall include:

(i) A discussion of the contents of this regulation and the contents of the material safety data sheet;

(ii) The purpose for and a description of the medical surveillance program required by this standard, including:

(A) A description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde.

(B) Instructions to immediately report to the employer the development of any adverse signs or symptoms that the employee suspects is attributable to formaldehyde exposure.

(iii) Description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure to formaldehyde in each job;

(iv) The purpose for, proper use of, and limitations of personal protective clothing;

(v) Instructions for the handling of spills, emergencies, and clean-up procedures;

(vi) An explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls;

(vii) A review of emergency procedures including the specific duties or assignments of each employee in the event of an emergency; and

(viii) The purpose, proper use, limitations, and other training requirements for respiratory protection as required by chapter 296-62 WAC, Part E.

(d) Access to training materials.

(i) The employer shall inform all affected employees of the location of written training materials and shall make these materials readily available, without cost, to the affected employees.

(ii) The employer shall provide, upon request, all training materials relating to the employee training program to the director of labor and industries, or his/her designated representative.

(15) Recordkeeping.

(a) Exposure measurements. The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to formaldehyde. This record shall include:

(i) The date of measurement;

(ii) The operation being monitored;

(iii) The methods of sampling and analysis and evidence of their accuracy and precision;

(iv) The number, durations, time, and results of samples taken;

(v) The types of protective devices worn; and

(vi) The names, job classifications, Social Security numbers, and exposure estimates of the employees whose exposures are represented by the actual monitoring results.

(b) Exposure determinations. Where the employer has determined that no monitoring is required under this standard, the employer shall maintain a record of the objective data relied upon to support the determination that no employee is exposed to formaldehyde at or above the action level.

(c) Medical surveillance. The employer shall establish and maintain an accurate record for each employee subject to medical surveillance under this standard. This record shall include:

(i) The name and Social Security number of the employee;

(ii) The physician's written opinion;

(iii) A list of any employee health complaints that may be related to exposure to formaldehyde; and

(iv) A copy of the medical examination results, including medical disease questionnaires and results of any medical tests required by the standard or mandated by the examining physician.

(d) Record retention. The employer shall retain records required by this standard for at least the following periods:

(i) Exposure records and determinations shall be kept for at least thirty years; and

(ii) Medical records shall be kept for the duration of employment plus thirty years.

(e) Availability of records.

(i) Upon request, the employer shall make all records maintained as a requirement of this standard available for examination and copying to the director of labor and industries, or his/her designated representative.

(ii) The employer shall make employee exposure records, including estimates made from representative monitoring and available upon request for examination and copy-

ing, to the subject employee, or former employee, and employee representatives in accordance with WAC 296-62-052 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(iii) Employee medical records required by this standard shall be provided upon request for examination and copying, to the subject employee, or former employee, or to anyone having the specific written consent of the subject employee or former employee in accordance with WAC 296-62-05201 through 296-62-05209, and 296-62-05213 through 296-62-05217.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07540, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07540, filed 7/20/94, effective 9/20/94; 92-23-017 (Order 92-13), § 296-62-07540, filed 11/10/92, effective 12/18/92; 91-11-070 (Order 91-01), § 296-62-07540, filed 5/20/91, effective 6/20/91; 90-03-029 (Order 89-20), § 296-62-07540, filed 1/11/90, effective 2/26/90; 88-21-002 (Order 88-23), § 296-62-07540, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07542 Appendix A—Substance technical guideline for formalin.

(1) The following substance technical guideline for formalin provides information on uninhibited formalin solution (thirty-seven percent formaldehyde, no methanol stabilizer). It is designed to inform employees at the production level of their rights and duties under the formaldehyde standard whether their job title defines them as workers or supervisors. Much of the information provided is general; however, some information is specific for formalin. When employee exposure to formaldehyde is from resins capable of releasing formaldehyde, the resin itself and other impurities or decomposition products may also be toxic, and employers should include this information as well when informing employees of the hazards associated with the materials they handle. The precise hazards associated with exposure to formaldehyde depend both on the form (solid, liquid, or gas) of the material and the concentration of formaldehyde present. For example, thirty-seven to fifty percent solutions of formaldehyde present a much greater hazard to the skin and eyes from spills or splashes than solutions containing less than one percent formaldehyde. Individual substance technical guidelines used by the employer for training employees should be modified to properly give information on the material actually being used.

(a) Substance identification.

(i) Chemical name: Formaldehyde.

(ii) Chemical family: Aldehyde.

(iii) Chemical formula: HCHO.

(iv) Molecular weight: 30.03.

(v) Chemical abstracts service number (CAS number): 50-00-0.

Synonyms: Formalin; Formic Aldehyde; Paraform; Formol; Formalin (Methanol-free); Fyde; Formalith; Methanal; Methyl Aldehyde; Methylene Glycol; Methylene Oxide; Tetraoxymethalene; Oxomethane; Oxymethylene.

(b) Components and contaminants.

(i) Percent: 37.0 Formaldehyde.

(ii) Percent: 63.0 water.

Note: Inhibited solutions contain methanol.

(iii) Other contaminants: Formic acid (alcohol free).

Exposure limits:

(A) WISHA TWA-0.75 ppm.

(B) WISHA STEL-2 ppm.

(c) Physical data.

(i) Description: Colorless liquid, pungent odor.

(ii) Boiling point: 214°F (101°C).

(iii) Specific gravity: 1.08 (H₂O = 1 @ 20 C).

(iv) pH: 2.8-4.0.

(v) Solubility in water: Miscible.

(vi) Solvent solubility: Soluble in alcohol and acetone.

(vii) Vapor density: 1.04 (Air = 1 @ 20 C).

(viii) Odor threshold: 0.8-1 ppm.

(d) Fire and explosion hazard.

(i) Moderate fire and explosion hazard when exposed to heat or flame.

(ii) The flash point of thirty-seven percent formaldehyde solutions is above normal room temperature, but the explosion range is very wide, from seven to seventy-three percent by volume in air.

(iii) Reaction of formaldehyde with nitrogen dioxide, nitromethane, perchloric acid and aniline, or peroxyformic acid yields explosive compounds.

(iv) Flash point: 185°F (85°C) closed cup.

(v) Lower explosion limit: Seven percent.

(vi) Upper explosion limit: Seventy-three percent.

(vii) Autoignition temperature: 806°F (430°C).

(viii) Flammable class (WISHA): III A.

Extinguishing media:

(I) Use dry chemical, "alcohol foam," carbon dioxide, or water in flooding amounts as fog. Solid streams may not be effective. Cool fire-exposed containers with water from side until well after fire is out.

(II) Use of water spray to flush spills can also dilute the spill to produce nonflammable mixtures. Water runoff, however, should be contained for treatment.

(ix) National Fire Protection Association Section 325M Designation:

(A) Health: 2-Materials hazardous to health, but areas may be entered with full-faced mask self-contained breathing apparatus which provides eye protection.

(B) Flammability: 2-Materials which must be moderately heated before ignition will occur. Water spray may be used to extinguish the fire because the material can be cooled below its flash point.

(C) Reactivity: D-Materials which (in themselves) are normally stable even under fire exposure conditions and which are not reactive with water. Normal fire fighting procedures may be used.

(e) Reactivity.

(i) Stability: Formaldehyde solutions may self-polymerize to form paraformaldehyde which precipitates.

(ii) Incompatibility (materials to avoid):

(A) Strong oxidizing agents, caustics, strong alkalies, isocyanates, anhydrides, oxides, and inorganic acids.

(B) Formaldehyde reacts with hydrochloric acid to form the potent carcinogen, bis-chloromethyl ether. Formaldehyde reacts with nitrogen dioxide, nitromethane, perchloric acid and aniline, or peroxyformic acid to yield explosive compounds. A violent reaction occurs when formaldehyde is mixed with strong oxidizers.

(C) Hazardous combustion or decomposition products: Oxygen from the air can oxidize formaldehyde to formic acid, especially when heated. Formic acid is corrosive.

(f) Health hazard data.

(i) Acute effects of exposure.

(A) Ingestion (swallowing): Liquids containing ten to forty percent formaldehyde cause severe irritation and inflammation of the mouth, throat, and stomach. Severe stomach pains will follow ingestion with possible loss of consciousness and death. Ingestion of dilute formaldehyde solutions (0.03-0.04%) may cause discomfort in the stomach and pharynx.

(B) Inhalation (breathing):

(I) Formaldehyde is highly irritating to the upper respiratory tract and eyes. Concentrations of 0.5 to 2.0 ppm may irritate the eyes, nose, and throat of some individuals.

(II) Concentrations of 3 to 5 ppm also cause tearing of the eyes and are intolerable to some persons.

(III) Concentrations of 10 to 20 ppm cause difficulty in breathing, burning of the nose and throat, coughing, and heavy tearing of the eyes, and 25 to 30 ppm causes severe respiratory tract injury leading to pulmonary edema and pneumonitis. A concentration of 100 ppm is immediately dangerous to life and health. Deaths from accidental exposure to high concentrations of formaldehyde have been reported.

(C) Skin (dermal): Formalin is a severe skin irritant and a sensitizer. Contact with formalin causes white discoloration, smarting, drying, cracking, and scaling. Prolonged and repeated contact can cause numbness and a hardening or tanning of the skin. Previously exposed persons may react to future exposure with an allergic eczematous dermatitis or hives.

(D) Eye contact: Formaldehyde solutions splashed in the eye can cause injuries ranging from transient discomfort to severe, permanent corneal clouding and loss of vision. The severity of the effect depends on the concentration of formaldehyde in the solution and whether or not the eyes are flushed with water immediately after the accident.

Note: The perception of formaldehyde by odor and eye irritation becomes less sensitive with time as one adapts to formaldehyde. This can lead to overexposure if a worker is relying on formaldehyde's warning properties to alert him or her to the potential for exposure.

(E) Acute animal toxicity:

(I) Oral, rats: LD₅₀=800 mg/kg.(II) Oral, mouse: LD₅₀=42 mg/kg.(III) Inhalation, rats: LC₅₀=250 mg/kg.(IV) Inhalation, mouse: LC₅₀=900 mg/kg.(V) Inhalation, rats: LC₅₀=590 mg/kg.

(g) Chronic effects of exposure.

(i) Carcinogenicity: Formaldehyde has the potential to cause cancer in humans. Repeated and prolonged exposure increases the risk. Various animal experiments have conclusively shown formaldehyde to be a carcinogen in rats. In humans, formaldehyde exposure has been associated with cancers of the lung, nasopharynx and oropharynx, and nasal passages.

(ii) Mutagenicity: Formaldehyde is genotoxic in several in vitro test systems showing properties of both an initiator and a promoter.

(iii) Toxicity: Prolonged or repeated exposure to formaldehyde may result in respiratory impairment. Rats exposed to formaldehyde at 2 ppm developed benign nasal tumors and changes of the cell structure in the nose as well as inflamed mucous membranes of the nose. Structural changes in the epithelial cells in the human nose have also been observed. Some persons have developed asthma or bronchitis following exposure to formaldehyde, most often as the result of an accidental spill involving a single exposure to a high concentration of formaldehyde.

(h) Emergency and first-aid procedures.

(i) Ingestion (swallowing): If the victim is conscious, dilute, inactivate, or absorb the ingested formaldehyde by giving milk, activated charcoal, or water. Any organic material will inactivate formaldehyde. Keep affected person warm and at rest. Get medical attention immediately. If vomiting occurs, keep head lower than hips.

(ii) Inhalation (breathing): Remove the victim from the exposure area to fresh air immediately. Where the formaldehyde concentration may be very high, each rescuer must put on a self-contained breathing apparatus before attempting to remove the victim, and medical personnel should be informed of the formaldehyde exposure immediately. If breathing has stopped, give artificial respiration. Keep the affected person warm and at rest. Qualified first-aid or medical personnel should administer oxygen, if available, and maintain the patient's airways and blood pressure until the victim can be transported to a medical facility. If exposure results in a highly irritated upper respiratory tract and coughing continues for more than ten minutes, the worker should be hospitalized for observation and treatment.

(iii) Skin contact: Remove contaminated clothing (including shoes) immediately. Wash the affected area of your body with soap or mild detergent and large amounts of water until no evidence of the chemical remains (at least fifteen to twenty minutes). If there are chemical burns, get first aid to cover the area with sterile, dry dressing, and bandages. Get medical attention if you experience appreciable eye or respiratory irritation.

(iv) Eye contact: Wash the eyes immediately with large amounts of water occasionally lifting lower and upper lids, until no evidence of chemical remains (at least fifteen to twenty minutes). In case of burns, apply sterile bandages loosely without medication. Get medical attention immediately. If you have experienced appreciable eye irritation from a splash or excessive exposure, you should be referred promptly to an ophthalmologist for evaluation.

(i) Emergency procedures.

(i) Emergencies:

(A) If you work in an area where a large amount of formaldehyde could be released in an accident or from equipment failure, your employer must develop procedures to be followed in event of an emergency. You should be trained in your specific duties in the event of an emergency, and it is important that you clearly understand these duties. Emergency equipment must be accessible and you should be trained to use any equipment that you might need. Formaldehyde contaminated equipment must be cleaned before reuse.

(B) If a spill of appreciable quantity occurs, leave the area quickly unless you have specific emergency duties. Do

not touch spilled material. Designated persons may stop the leak and shut off ignition sources if these procedures can be done without risk. Designated persons should isolate the hazard area and deny entry except for necessary people protected by suitable protective clothing and respirators adequate for the exposure. Use water spray to reduce vapors. Do not smoke, and prohibit all flames or flares in the hazard area.

(ii) Special fire fighting procedures:

(A) Learn procedures and responsibilities in the event of a fire in your workplace.

(B) Become familiar with the appropriate equipment and supplies and their location.

(C) In fire fighting, withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire.

(j) Spill, leak, and disposal procedures.

(i) Occupational spill: For small containers, place the leaking container in a well ventilated area. Take up small spills with absorbent material and place the waste into properly labeled containers for later disposal. For larger spills, dike the spill to minimize contamination and facilitate salvage or disposal. You may be able to neutralize the spill with sodium hydroxide or sodium sulfite. Your employer must comply with EPA rules regarding the clean-up of toxic waste and notify state and local authorities, if required. If the spill is greater than 1,000 lb/day, it is reportable under EPA's superfund legislation.

(ii) Waste disposal: Your employer must dispose of waste containing formaldehyde in accordance with applicable local, state, and federal law and in a manner that minimizes exposure of employees at the site and of the clean-up crew.

(k) Monitoring and measurement procedures.

(i) Monitoring requirements: If your exposure to formaldehyde exceeds the 0.5 ppm action level or the 2 ppm STEL, your employer must monitor your exposure. Your employer need not measure every exposure if a "high exposure" employee can be identified. This person usually spends the greatest amount of time nearest the process equipment. If you are a "representative employee," you will be asked to wear a sampling device to collect formaldehyde. This device may be a passive badge, a sorbent tube attached to a pump, or an impinger containing liquid. You should perform your work as usual, but inform the person who is conducting the monitoring of any difficulties you are having wearing the device.

(ii) Evaluation of 8-hour exposure: Measurements taken for the purpose of determining time-weighted average (TWA) exposures are best taken with samples covering the full shift. Samples collected must be taken from the employee's breathing zone air.

(iii) Short-term exposure evaluation: If there are tasks that involve brief but intense exposure to formaldehyde, employee exposure must be measured to assure compliance with the STEL. Sample collections are for brief periods, only fifteen minutes, but several samples may be needed to identify the peak exposure.

(iv) Monitoring techniques: WISHA's only requirement for selecting a method for sampling and analysis is that the methods used accurately evaluate the concentration of formaldehyde in employees' breathing zones. Sampling and anal-

ysis may be performed by collection of formaldehyde on liquid or solid sorbents with subsequent chemical analysis. Sampling and analysis may also be performed by passive diffusion monitors and short-term exposure may be measured by instruments such as real-time continuous monitoring systems and portable direct reading instruments.

(v) Notification of results: Your employer must inform you of the results of exposure monitoring representative of your job. You may be informed in writing, but posting the results where you have ready access to them constitutes compliance with the standard.

(l) Protective equipment and clothing.

(Material impervious to formaldehyde is needed if the employee handles formaldehyde solutions of one percent or more. Other employees may also require protective clothing or equipment to prevent dermatitis.)

(i) Respiratory protection. Use NIOSH-approved full facepiece negative pressure respirators equipped with approved cartridges or canisters within the use limitations of these devices. (Present restrictions on cartridges and canisters do not permit them to be used for a full workshift.) In all other situations, use positive pressure respirators such as the positive-pressure air purifying respirator or the self-contained breathing apparatus (SCBA).

(ii) Protective gloves:

(A) Wear protective (impervious) gloves provided by your employer, at no cost, to prevent contact with formalin.

(B) Your employer should select these gloves based on the results of permeation testing and in accordance with the ACGIH guidelines for selection of chemical protective clothing.

(iii) Eye protection:

(A) If you might be splashed in the eyes with formalin, it is essential that you wear goggles or some other type of complete protection for the eye.

(B) You may also need a face shield if your face is likely to be splashed with formalin, but you must not substitute face shields for eye protection. (This section pertains to formaldehyde solutions of one percent or more.)

(iv) Other protective equipment:

(A) You must wear protective (impervious) clothing and equipment provided by your employer at no cost to prevent repeated or prolonged contact with formaldehyde liquids.

(B) If you are required to change into whole-body chemical protective clothing, your employer must provide a change room for your privacy and for storage of your normal clothing.

(C) If you are splashed with formaldehyde, use the emergency showers and eyewash fountains provided by your employer immediately to prevent serious injury. Report the incident to your supervisor and obtain necessary medical support.

(2) Entry into an IDLH atmosphere. Enter areas where the formaldehyde concentration might be 100 ppm or more only with complete body protection including a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a supplied-air respirator with full facepiece and operated in a positive pressure mode. This equipment is essential to protect your life and health under such extreme conditions.

(a) Engineering controls.

(i) Ventilation is the most widely applied engineering control method for reducing the concentration of airborne substances in the breathing zones of workers. There are two distinct types of ventilation.

(ii) Local exhaust: Local exhaust ventilation is designed to capture airborne contaminants as near to the point of generation as possible. To protect you, the direction of contaminant flow must always be toward the local exhaust system inlet and away from you.

(iii) General (mechanical):

(A) General dilution ventilation involves continuous introduction of fresh air into the workroom to mix with the contaminated air and lower your breathing zone concentration of formaldehyde. Effectiveness depends on the number of air changes per hour.

(B) Where devices emitting formaldehyde are spread out over a large area, general dilution ventilation may be the only practical method of control.

(iv) Work practices: Work practices and administrative procedures are an important part of a control system. If you are asked to perform a task in a certain manner to limit your exposure to formaldehyde, it is extremely important that you follow these procedures.

(b) Medical surveillance.

(i) Medical surveillance helps to protect employees' health. You are encouraged strongly to participate in the medical surveillance program.

(ii) Your employer must make a medical surveillance program available at no expense to you and at a reasonable time and place if you are exposed to formaldehyde at concentrations above 0.5 ppm as an 8-hour average or 2 ppm over any fifteen-minute period.

(A) You will be offered medical surveillance at the time of your initial assignment and once a year afterward as long as your exposure is at least 0.5 ppm (action level) or 2 ppm (STEL).

(B) Even if your exposure is below these levels, you should inform your employer if you have signs and symptoms that you suspect, through your training, are related to your formaldehyde exposure because you may need medical surveillance to determine if your health is being impaired by your exposure.

(iii) The surveillance plan includes:

(A) A medical disease questionnaire.

(B) A physical examination if the physician determines this is necessary.

(iv) If you are required to wear a respirator, your employer must offer you a physical examination and a pulmonary function test every year.

(v) The physician must collect all information needed to determine if you are at increased risk from your exposure to formaldehyde. At the physician's discretion, the medical examination may include other tests, such as a chest x-ray, to make this determination.

(vi) After a medical examination the physician will provide your employer with a written opinion which includes any special protective measures recommended and any restrictions on your exposure. The physician must inform you of any medical conditions you have which would be aggra-

vated by exposure to formaldehyde. All records from your medical examinations, including disease surveys, must be retained at your employer's expense.

(c) Emergencies.

(i) If you are exposed to formaldehyde in an emergency and develop signs or symptoms associated with acute toxicity from formaldehyde exposure, your employer must provide you with a medical examination as soon as possible.

(ii) This medical examination will include all steps necessary to stabilize your health.

(iii) You may be kept in the hospital for observation if your symptoms are severe to ensure that any delayed effects are recognized and treated.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-62-07542, filed 8/17/99, effective 12/1/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07542, filed 7/20/94, effective 9/20/94; 92-23-017 (Order 92-13), § 296-62-07542, filed 11/10/92, effective 12/18/92; 88-21-002 (Order 88-23), § 296-62-07542, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07544 Appendix B—Sampling strategy and analytical methods for formaldehyde. (1) To protect the health of employees, exposure measurements must be unbiased and representative of employee exposure. The proper measurement of employee exposure requires more than a token commitment on the part of the employer. WISHA's mandatory requirements establish a baseline; under the best of circumstances all questions regarding employee exposure will be answered. Many employers, however, will wish to conduct more extensive monitoring before undertaking expensive commitments, such as engineering controls, to assure that the modifications are truly necessary. The following sampling strategy, which was developed at NIOSH by Nelson A. Leidel, Kenneth A. Busch, and Jeremiah R. Lynch and described in NIOSH publication No. 77-173 (Occupational Exposure Sampling Strategy Manual) will assist the employer in developing a strategy for determining the exposure of his or her employees.

(2) There is no one correct way to determine employee exposure. Obviously, measuring the exposure of every employee exposed to formaldehyde will provide the most information on any given day. Where few employees are exposed, this may be a practical solution. For most employers, however, use of the following strategy will give just as much information at less cost.

(3) Exposure data collected on a single day will not automatically guarantee the employer that his or her workplace is always in compliance with the formaldehyde standard. This does not imply, however, that it is impossible for an employer to be sure that his or her worksite is in compliance with the standard. Indeed, a properly designed sampling strategy showing that all employees are exposed below the PELs, at least with a ninety-five percent certainty, is compelling evidence that the exposure limits are being achieved provided that measurements are conducted using valid sampling strategy and approved analytical methods.

(4) There are two PELs, the TWA concentration and the STEL.

(a) Most employers will find that one of these two limits is more critical in the control of their operations, and WISHA

expects that the employer will concentrate monitoring efforts on the critical component.

(b) If the more difficult exposure is controlled, this information, along with calculations to support the assumptions, should be adequate to show that the other exposure limit is also being achieved.

(5) Sampling strategy.

(a) Determination of the need for exposure measurements.

(b) The employer must determine whether employees may be exposed to concentrations in excess of the action level. This determination becomes the first step in an employee exposure monitoring program that minimizes employer sampling burdens while providing adequate employee protection.

(c) If employees may be exposed above the action level, the employer must measure exposure. Otherwise, an objective determination that employee exposure is low provides adequate evidence that exposure potential has been examined.

(d) The employer should examine all available relevant information, e.g., insurance company and trade association data and information from suppliers or exposure data collected from similar operations.

(e) The employer may also use previously-conducted sampling including area monitoring. The employer must make a determination relevant to each operation although this need not be on a separate piece of paper.

(f) If the employer can demonstrate conclusively that no employee is exposed above the action level or the STEL through the use of objective data, the employer need proceed no further on employee exposure monitoring until such time that conditions have changed and the determination is no longer valid.

(g) If the employer cannot determine that employee exposure is less than the action level and the STEL, employee exposure monitoring will have to be conducted.

(6) Workplace material survey.

(a) The primary purpose of a survey of raw material is to determine if formaldehyde is being used in the work environment and if so, the conditions under which formaldehyde is being used.

(b) The first step is to tabulate all situations where formaldehyde is used in a manner such that it may be released into the workplace atmosphere or contaminate the skin. This information should be available through analysis of company records and information on the MSDSs available through provisions of this standard and the hazard communication standard.

(c) If there is an indication from materials handling records and accompanying MSDSs that formaldehyde is being used in the following types of processes or work operations, there may be a potential for releasing formaldehyde into the workplace atmosphere:

(i) Any operation that involves grinding, sanding, sawing, cutting, crushing, screening, sieving, or any other manipulation of material that generates formaldehyde-bearing dust.

(ii) Any processes where there have been employee complaints or symptoms indicative of exposure to formaldehyde.

(iii) Any liquid or spray process involving formaldehyde.

(iv) Any process that uses formaldehyde in preserved tissue.

(v) Any process that involves the heating of a formaldehyde-bearing resin.

Processes and work operations that use formaldehyde in these manners will probably require further investigation at the worksite to determine the extent of employee monitoring that should be conducted.

(7) Workplace observations.

(a) To this point, the only intention has been to provide an indication as to the existence of potentially exposed employees. With this information, a visit to the workplace is needed to observe work operations, to identify potential health hazards, and to determine whether any employees may be exposed to hazardous concentrations of formaldehyde.

(b) In many circumstances, sources of formaldehyde can be identified through the sense of smell. However, this method of detection should be used with caution because of olfactory fatigue.

(c) Employee location in relation to source of formaldehyde is important in determining if an employee may be significantly exposed to formaldehyde. In most instances, the closer a worker is to the source, the higher the probability that a significant exposure will occur.

(d) Other characteristics should be considered. Certain high temperature operations give rise to higher evaporation rates. Locations of open doors and windows provide natural ventilation that tend to dilute formaldehyde emissions. General room ventilation also provides a measure of control.

(8) Calculation of potential exposure concentrations.

(a) By knowing the ventilation rate in a workplace and the quantity of formaldehyde generated, the employer may be able to determine by calculation if the PELs might be exceeded.

(b) To account for poor mixing of formaldehyde into the entire room, locations of fans and proximity of employees to the work operation, the employer must include a safety factor.

(c) If an employee is relatively close to a source, particularly if he or she is located downwind, a safety factor of one hundred may be necessary.

(d) For other situations, a factor of ten may be acceptable. If the employer can demonstrate through such calculations that employee exposure does not exceed the action level or the STEL, the employer may use this information as objective data to demonstrate compliance with the standard.

(9) Sampling strategy.

(a) Once the employer determines that there is a possibility of substantial employee exposure to formaldehyde, the employer is obligated to measure employee exposure.

(b) The next step is selection of a maximum risk employee. When there are different processes where employees may be exposed to formaldehyde, a maximum risk employee should be selected for each work operation.

(c) Selection of the maximum risk employee requires professional judgment. The best procedure for selecting the maximum risk employee is to observe employees and select the person closest to the source of formaldehyde. Employee

mobility may affect this selection; e.g., if the closest employee is mobile in his tasks, he may not be the maximum risk employee. Air movement patterns and differences in work habits will also affect selection of the maximum risk employee.

(d) When many employees perform essentially the same task, a maximum risk employee cannot be selected. In this circumstance, it is necessary to resort to random sampling of the group of workers. The objective is to select a subgroup of adequate size so that there is a high probability that the random sample will contain at least one worker with high exposure if one exists. The number of persons in the group influences the number that need to be sampled to ensure that at least one individual from the highest ten percent exposure group is contained in the sample. For example, to have ninety percent confidence in the results, if the group size is ten, nine should be sampled; for fifty, only eighteen need to be sampled.

(e) If measurement shows exposure to formaldehyde at or above the action level or the STEL, the employer needs to identify all other employees who may be exposed at or above the action level or STEL and measure or otherwise accurately characterize the exposure of these employees.

(f) Whether representative monitoring or random sampling are conducted, the purpose remains the same to determine if the exposure of any employee is above the action level. If the exposure of the most exposed employee is less than the action level and the STEL, regardless of how the employee is identified, then it is reasonable to assume that measurements of exposure of the other employees in that operation would be below the action level and the STEL.

(10) Exposure measurements.

(a) There is no "best" measurement strategy for all situations. Some elements to consider in developing a strategy are:

(i) Availability and cost of sampling equipment;

(ii) Availability and cost of analytic facilities;

(iii) Availability and cost of personnel to take samples;

(iv) Location of employees and work operations;

(v) Intraday and interday variations in the process;

(vi) Precision and accuracy of sampling and analytic methods; and

(vii) Number of samples needed.

(b) Samples taken for determining compliance with the STEL differ from those that measure the TWA concentration in important ways. STEL samples are best taken in a nonrandom fashion using all available knowledge relating to the area, the individual, and the process to obtain samples during periods of maximum expected concentrations. At least three measurements on a shift are generally needed to spot gross errors or mistakes; however, only the highest value represents the STEL.

(c) If an operation remains constant throughout the workshift, a much greater number of samples would need to be taken over the thirty-two discrete nonoverlapping periods in an 8-hour workshift to verify compliance with a STEL. If employee exposure is truly uniform throughout the workshift, however, an employer in compliance with the 1 ppm TWA would be in compliance with the 2 ppm STEL, and this determination can probably be made using objective data.

(11) Need to repeat the monitoring strategy.

(a) Interday and intraday fluctuations in employee exposure are mostly influenced by the physical processes that generate formaldehyde and the work habits of the employee. Hence, in-plant process variations influence the employer's determination of whether or not additional controls need to be imposed. Measurements that employee exposure is low on a day that is not representative of worst conditions may not provide sufficient information to determine whether or not additional engineering controls should be installed to achieve the PELs.

(b) The person responsible for conducting sampling must be aware of systematic changes which will negate the validity of the sampling results. Systematic changes in formaldehyde exposure concentration for an employee can occur due to:

(i) The employee changing patterns of movement in the workplace;

(ii) Closing of plant doors and windows;

(iii) Changes in ventilation from season to season;

(iv) Decreases in ventilation efficiency or abrupt failure of engineering control equipment; and

(v) Changes in the production process or work habits of the employee.

(c) Any of these changes, if they may result in additional exposure that reaches the next level of action (i.e., 0.5 or 1.0 ppm as an 8-hour average or 2 ppm over fifteen minutes) require the employer to perform additional monitoring to reassess employee exposure.

(d) A number of methods are suitable for measuring employee exposure to formaldehyde or for characterizing emissions within the worksite. The preamble to this standard describes some methods that have been widely used or subjected to validation testing. A detailed analytical procedure derived from the WISHA Method A.C.R.O. for acrolein and formaldehyde is presented below for informational purposes.

(e) Inclusion of WISHA's method in this appendix in no way implies that it is the only acceptable way to measure employee exposure to formaldehyde. Other methods that are free from significant interferences and that can determine formaldehyde at the permissible exposure limits within ± 25 percent of the "true" value at the ninety-five percent confidence level are also acceptable. Where applicable, the method should also be capable of measuring formaldehyde at the action level to ± 35 percent of the "true" value with a ninety-five percent confidence level. WISHA encourages employers to choose methods that will be best for their individual needs. The employer must exercise caution, however, in choosing an appropriate method since some techniques suffer from interferences that are likely to be present in workplaces of certain industry sectors where formaldehyde is used.

(12) WISHA's analytical laboratory method.

A.C.R.O. (also use methods F.O.R.M. and F.O.R.M. 2 when applicable).

(a) Matrix: Air.

(b) Target concentration: 1 ppm (1.2 mg/m³).

(c) Procedures: Air samples are collected by drawing known volumes of air through sampling tubes containing XAD-2 adsorbent which have been coated with 2-(hydroxymethyl) piperidine. The samples are desorbed with toluene

and then analyzed by gas chromatography using a nitrogen selective detector.

(d) Recommended sampling rate and air volumes: 0.1 L/min and 24 L.

(e) Reliable quantitation limit: 16 ppb (20 ug/m³).

(f) Standard error of estimate at the target concentration: 7.3%.

(g) Status of the method: A sampling and analytical method that has been subjected to the established evaluation procedures of the organic methods evaluation branch.

(h) Date: March, 1985.

(13) General discussion.

(a) Background: The current WISHA method for collecting acrolein vapor recommends the use of activated 13X molecular sieves. The samples must be stored in an ice bath during and after sampling and also they must be analyzed within forty-eight hours of collection. The current WISHA method for collecting formaldehyde vapor recommends the use of bubblers containing ten percent methanol in water as the trapping solution.

(b) This work was undertaken to resolve the sample stability problems associated with acrolein and also to eliminate the need to use bubblers to sample formaldehyde. A goal of this work was to develop and/or to evaluate a common sampling and analytical procedure for acrolein and formaldehyde.

(c) NIOSH has developed independent methodologies for acrolein and formaldehyde which recommend the use of reagent-coated adsorbent tubes to collect the aldehydes as stable derivatives. The formaldehyde sampling tubes contain Chromosorb 102 adsorbent coated with N-benzylethanolamine (BEA) which reacts with formaldehyde vapor to form a stable oxazolidine compound. The acrolein sampling tubes contain XAD-2 adsorbent coated with 2-(hydroxymethyl) piperidine (2-HMP) which reacts with acrolein vapor to form a different, stable oxazolidine derivative. Acrolein does not appear to react with BEA to give a suitable reaction product. Therefore, the formaldehyde procedure cannot provide a common method for both aldehydes. However, formaldehyde does react with 2-HMP to form a very suitable reaction product. It is the quantitative reaction of acrolein and formaldehyde with 2-HMP that provides the basis for this evaluation.

(d) This sampling and analytical procedure is very similar to the method recommended by NIOSH for acrolein. Some changes in the NIOSH methodology were necessary to permit the simultaneous determination of both aldehydes and also to accommodate WISHA laboratory equipment and analytical techniques.

(14) Limit-defining parameters: The analyte air concentrations reported in this method are based on the recommended air volume for each analyte collected separately and a desorption volume of 1 mL. The amounts are presented as acrolein and/or formaldehyde, even though the derivatives are the actual species analyzed.

(15) Detection limits of the analytical procedure: The detection limit of the analytical procedure was 386 pg per injection for formaldehyde. This was the amount of analyte which gave a peak whose height was about five times the height of the peak given by the residual formaldehyde deriv-

ative in a typical blank front section of the recommended sampling tube.

(16) Detection limits of the overall procedure: The detection limits of the overall procedure were 482 ng per sample (16 ppb or 20 ug/m³ for formaldehyde). This was the amount of analyte spiked on the sampling device which allowed recoveries approximately equal to the detection limit of the analytical procedure.

(17) Reliable quantitation limits:

(a) The reliable quantitation limit was 482 ng per sample (16 ppb or 20 ug/m³) for formaldehyde. These were the smallest amounts of analyte which could be quantitated within the limits of a recovery of at least seventy-five percent and a precision (± 1.96 SD) of $\pm 25\%$ or better.

(b) The reliable quantitation limit and detection limits reported in the method are based upon optimization of the instrument for the smallest possible amount of analyte. When the target concentration of an analyte is exceptionally higher than these limits, they may not be attainable at the routine operating parameters.

(18) Sensitivity: The sensitivity of the analytical procedure over concentration ranges representing 0.4 to 2 times the target concentration, based on the recommended air volumes, was seven thousand five hundred eighty-nine area units per ug/mL for formaldehyde. This value was determined from the slope of the calibration curve. The sensitivity may vary with the particular instrument used in the analysis.

(19) Recovery: The recovery of formaldehyde from samples used in an eighteen-day storage test remained above ninety-two percent when the samples were stored at ambient temperature. These values were determined from regression lines which were calculated from the storage data. The recovery of the analyte from the collection device must be at least seventy-five percent following storage.

(20) Precision (analytical method only): The pooled coefficient of variation obtained from replicate determinations of analytical standards over the range of 0.4 to 2 times the target concentration was 0.0052 for formaldehyde ((d)(C)(iii) of this subsection).

(21) Precision (overall procedure): The precision at the ninety-five percent confidence level for the ambient temperature storage tests was $\pm 14.3\%$ for formaldehyde. These values each include an additional $\pm 5\%$ for sampling error. The overall procedure must provide results at the target concentrations that are $\pm 25\%$ at the ninety-five percent confidence level.

(22) Reproducibility: Samples collected from controlled test atmospheres and a draft copy of this procedure were given to a chemist unassociated with this evaluation. The formaldehyde samples were analyzed following fifteen days storage. The average recovery was 96.3% and the standard deviation was 1.7%.

(23) Advantages:

(a) The sampling and analytical procedures permit the simultaneous determination of acrolein and formaldehyde.

(b) Samples are stable following storage at ambient temperature for at least eighteen days.

(24) Disadvantages: None.

(25) Sampling procedure.

(a) Apparatus:

(i) Samples are collected by use of a personal sampling pump that can be calibrated to within $\pm 5\%$ of the recommended 0.1 L/min sampling rate with the sampling tube in line.

(ii) Samples are collected with laboratory prepared sampling tubes. The sampling tube is constructed of silane treated glass and is about 8-cm long. The ID is 4 mm and the OD is 6 mm. One end of the tube is tapered so that a glass wool end plug will hold the contents of the tube in place during sampling. The other end of the sampling tube is open to its full 4-mm ID to facilitate packing of the tube. Both ends of the tube are fire-polished for safety. The tube is packed with a 75-mg backup section, located nearest the tapered end and a 150-mg sampling section of pretreated XAD-2 adsorbent which has been coated with 2-HMP. The two sections of coated adsorbent are separated and retained with small plugs of silanized glass wool. Following packing, the sampling tubes are sealed with two 7/32 inch OD plastic end caps. Instructions for the pretreatment and the coating of XAD-2 adsorbent are presented in (d) of this subsection.

(b) Sampling tubes, similar to those recommended in this method, are marketed by Supelco, Inc. These tubes were not available when this work was initiated; therefore, they were not evaluated.

(26) Reagents: None required.

(27) Technique:

(a) Properly label the sampling tube before sampling and then remove the plastic end caps.

(b) Attach the sampling tube to the pump using a section of flexible plastic tubing such that the large, front section of the sampling tube is exposed directly to the atmosphere. Do not place any tubing ahead of the sampling tube. The sampling tube should be attached in the worker's breathing zone in a vertical manner such that it does not impede work performance.

(c) After sampling for the appropriate time, remove the sampling tube from the pump and then seal the tube with plastic end caps.

(d) Include at least one blank for each sampling set. The blank should be handled in the same manner as the samples with the exception that air is not drawn through it.

(e) List any potential interferences on the sample data sheet.

(28) Breakthrough:

(a) Breakthrough was defined as the relative amount of analyte found on a backup sample in relation to the total amount of analyte collected on the sampling train.

(b) For formaldehyde collected from test atmospheres containing six times the PEL, the average five percent breakthrough air volume was 41 L. The sampling rate was 0.1 L/min and the average mass of formaldehyde collected was 250 ug.

(29) Desorption efficiency: No desorption efficiency corrections are necessary to compute air sample results because analytical standards are prepared using coated adsorbent. Desorption efficiencies were determined, however, to investigate the recoveries of the analytes from the sampling device. The average recovery over the range of 0.4 to 2 times the target concentration, based on the recommended air vol-

umes, was 96.2% for formaldehyde. Desorption efficiencies were essentially constant over the ranges studied.

(30) Recommended air volume and sampling rate:

(a) The recommended air volume for formaldehyde is 24 L.

(b) The recommended sampling rate is 0.1 L/min.

(31) Interferences:

(a) Any collected substance that is capable of reacting with 2-HMP and thereby depleting the derivatizing agent is a potential interference. Chemicals which contain a carbonyl group, such as acetone, may be capable of reacting with 2-HMP.

(b) There are no other known interferences to the sampling method.

(32) Safety precautions:

(a) Attach the sampling equipment to the worker in such a manner that it will not interfere with work performance or safety.

(b) Follow all safety practices that apply to the work area being sampled.

(33) Analytical procedure.

(a) Apparatus:

(i) A gas chromatograph (GC), equipped with a nitrogen selective detector. A Hewlett-Packard model 5840A GC fitted with a nitrogen phosphorus flame ionization detector (NPD) was used for this evaluation. Injections were performed using a Hewlett-Packard model 7671A automatic sampler.

(ii) A GC column capable of resolving the analytes from any interference. A 6 ft x 1/4 in OD (2mm ID) glass GC column containing 10% UCON 50-HB-5100+ 2% KOH on 80/100 mesh Chromosorb W-AW was used for the evaluation. Injections were performed on-column.

(iii) Vials, glass 2-mL with Teflon-lined caps.

(iv) Volumetric flasks, pipets, and syringes for preparing standards, making dilutions, and performing injections.

(b) Reagents:

(i) Toluene and dimethylformamide. Burdick and Jackson solvents were used in this evaluation.

(ii) Helium, hydrogen, and air, GC grade.

(iii) Formaldehyde, thirty-seven percent by weight, in water. Aldrich Chemical, ACS Reagent Grade formaldehyde was used in this evaluation.

(iv) Amberlite XAD-2 adsorbent coated with 2-(hydroxymethyl) piperidine (2-HMP), 10% by weight ((d) of this subsection).

(v) Desorbing solution with internal standard. This solution was prepared by adding 20 uL of dimethylformamide to 100 mL of toluene.

(c) Standard preparation:

(i) Formaldehyde: Prepare stock standards by diluting known volumes of thirty-seven percent formaldehyde solution with methanol. A procedure to determine the formaldehyde content of these standards is presented in (d) of this subsection. A standard containing 7.7 mg/mL formaldehyde was prepared by diluting 1 mL of the thirty-seven percent reagent to 50 mL with methanol.

(ii) It is recommended that analytical standards be prepared about sixteen hours before the air samples are to be analyzed in order to ensure the complete reaction of the ana-

lytes with 2-HMP. However, rate studies have shown the reaction to be greater than ninety-five percent complete after four hours. Therefore, one or two standards can be analyzed after this reduced time if sample results are outside the concentration range of the prepared standards.

(iii) Place 150-mg portions of coated XAD-2 adsorbent, from the same lot number as used to collect the air samples, into each of several glass 2-mL vials. Seal each vial with a Teflon-lined cap.

(iv) Prepare fresh analytical standards each day by injecting appropriate amounts of the diluted analyte directly onto 150-mg portions of coated adsorbent. It is permissible to inject both acrolein and formaldehyde on the same adsorbent portion. Allow the standards to stand at room temperature. A standard, approximately the target levels, was prepared by injecting 11 uL of the acrolein and 12 uL of the formaldehyde stock standards onto a single coated XAD-2 adsorbent portion.

(v) Prepare a sufficient number of standards to generate the calibration curves. Analytical standard concentrations should bracket sample concentrations. Thus, if samples are not in the concentration range of the prepared standards, additional standards must be prepared to determine detector response.

(vi) Desorb the standards in the same manner as the samples following the sixteen-hour reaction time.

(d) Sample preparation:

(i) Transfer the 150-mg section of the sampling tube to a 2-mL vial. Place the 75-mg section in a separate vial. If the glass wool plugs contain a significant number of adsorbent beads, place them with the appropriate sampling tube section. Discard the glass wool plugs if they do not contain a significant number of adsorbent beads.

(ii) Add 1 mL of desorbing solution to each vial.

(iii) Seal the vials with Teflon-lined caps and then allow them to desorb for one hour. Shake the vials by hand with vigorous force several times during the desorption time.

(iv) Save the used sampling tubes to be cleaned and recycled.

(e) Analysis:

(f) GC conditions.

(34) Column temperature:

(a) Bi-level temperature program.

(i) First level: 100°C to 140°C at 4°C/min following completion of the first level.

(ii) Second level: 140°C to 180°C at 20°C/min following completion of the first level.

(b) Isothermal period: Hold column at 180°C until the recorder pen returns to baseline (usually about twenty-five minutes after injection).

(c) Injector temperature: 180°C.

(d) Helium flow rate: 30 mL/min (detector response will be reduced if nitrogen is substituted for helium carrier gas).

(e) Injection volume: 51 0.8 uL.

(f) GC column: Six-ft x 1/4-in OD (2 mm ID) glass GC column containing 10% UCON 50-HB-5100N ZG651 + 512% KOH on 80/100 Chromosorb W-AW.

(g) NPD conditions:

(i) Hydrogen flow rate: 3 mL/min.

(ii) Air flow rate: 50 mL/min.

(h) Detector temperature: 275 5151C.

(i) Use a suitable method, such as electronic integration, to measure detector response.

(ii) Use an internal standard method to prepare the calibration curve with several standard solutions of different concentrations. Prepare the calibration curve daily. Program the integrator to report results in ug/mL.

(iii) Bracket sample concentrations with standards.

(iv) Interferences (analytical).

(A) Any compound with the same general retention time as the analytes and which also gives a detector response is a potential interference. Possible interferences should be reported to the laboratory with submitted samples by the industrial hygienist.

(B) GC parameters (temperature, column, etc.), may be changed to circumvent interferences.

(C) A useful means of structure designation is GC/MS. It is recommended this procedure be used to confirm samples whenever possible.

(D) The coated adsorbent usually contains a very small amount of residual formaldehyde derivative.

(i) Calculations:

(i) Results are obtained by use of calibration curves. Calibration curves are prepared by plotting detector response against concentration for each standard. The best line through the data points is determined by curve fitting.

(ii) The concentration, in ug/mL, for a particular sample is determined by comparing its detector response to the calibration curve. If either of the analytes is found on the backup section, it is added to the amount found on the front section. Blank corrections should be performed before adding the results together.

(iii) The acrolein and/or formaldehyde air concentration can be expressed using the following equation:

$$\text{Mg/m}^3 = (A)(B)/C.$$

where A=ug/mL from 3.7.2, B=desorption volume, and C=L of air sampled.

No desorption efficiency corrections are required.

(iv) The following equation can be used to convert results in mg/m³ to ppm.

$$\text{ppm} = (\text{mg/m}^3)(24.45)/\text{MW}$$

where mg/m³=result from 3.7.3, 24.45=molar volume of an ideal gas at 760 mm Hg and 25 5151C, MW=molecular weight (Formaldehyde=30.0).

(j) Backup data. Backup data on detection limits, reliable quantitation limits, sensitivity and precision of the analytical method, breakthrough, desorption efficiency, storage, reproducibility, and generation of test atmospheres are available in OSHA Method 52, developed by the Organics Methods Evaluation Branch, OSHA Analytical Laboratory, Salt Lake City, Utah.

(k) Procedure to coat XAD-2 adsorbent with 2-HMP:

(i) Apparatus: Soxhlet extraction apparatus, rotary evaporation apparatus, vacuum dessicator, 1-L vacuum flask, 1-L round-bottomed evaporative flask, 1-L Erlenmeyer flask, 250-mL Buchner funnel with a coarse fritted disc, etc.

(ii) Reagents:

(A) Methanol, isooctane, and toluene.

(B) (Hydroxymethyl) piperidine.

(C) Amberlite XAD-2 nonionic polymeric adsorbent, twenty to sixty mesh, Aldrich Chemical XAD-2 was used in this evaluation.

(l) Procedure: Weigh 125 g of crude XAD-2 adsorbent into a 1-L Erlenmeyer flask. Add about 200 mL of water to the flask and then swirl the mixture to wash the adsorbent. Discard any adsorbent that floats to the top of the water and then filter the mixture using a fritted Buchner funnel. Air dry the adsorbent for two minutes. Transfer the adsorbent back to the Erlenmeyer flask and then add about 200 mL of methanol to the flask. Swirl and then filter the mixture as before. Transfer the washed adsorbent back to the Erlenmeyer flask and then add about 200 mL of methanol to the flask. Swirl and then filter the mixture as before. Transfer the washed adsorbent to a 1-L round-bottomed evaporative flask, add 13 g of 2-HMP and then 200 mL of methanol, swirl the mixture and then allow it to stand for one hour. Remove the methanol at about 40°C and reduced pressure using a rotary evaporation apparatus. Transfer the coated adsorbent to a suitable container and store it in a vacuum desiccator at room temperature overnight. Transfer the coated adsorbent to a Soxhlet extractor and then extract the material with toluene for about twenty-four hours. Discard the contaminated toluene, add methanol in its place and then continue the Soxhlet extraction for an additional four hours. Transfer the adsorbent to a weighted 1-L round-bottom evaporative flask and remove the methanol using the rotary evaporation apparatus. Determine the weight of the adsorbent and then add an amount of 2-HMP, which is ten percent by weight of the adsorbent. Add 200 mL of methanol and then swirl the mixture. Allow the mixture to stand for one hour. Remove the methanol by rotary evaporation. Transfer the coated adsorbent to a suitable container and store it in a vacuum dessicator until all traces of solvents are gone. Typically, this will take two to three days. The coated adsorbent should be protected from contamination. XAD-2 adsorbent treated in this manner will probably not contain residual acrolein derivative. However, this adsorbent will often contain residual formaldehyde derivative levels of about 0.1 ug per 150 mg of adsorbent. If the blank values for a batch of coated adsorbent are too high, then the batch should be returned to the Soxhlet extractor, extracted with toluene again and then recoated. This process can be repeated until the desired blank levels are attained.

The coated adsorbent is now ready to be packed into sampling tubes. The sampling tubes should be stored in a sealed container to prevent contamination. Sampling tubes should be stored in the dark at room temperature. The sampling tubes should be segregated by coated adsorbent lot number. A sufficient amount of each lot number of coated adsorbent should be retained to prepare analytical standards for use with air samples from that lot number.

(m) A procedure to determine formaldehyde by acid titration:

(i) Standardize the 0.1 N HCl solution using sodium carbonate and methyl orange indicator.

(ii) Place 50 mL of 0.1 M sodium sulfite and three drops of thymophthalein indicator into a 250-mL Erlenmeyer flask. Titrate the contents of the flask to a colorless endpoint with 0.1 N HCl (usually one or two drops is sufficient). Transfer 10 mL of the formaldehyde/methanol solution ((b)(iii)(A) of

this subsection) into the same flask and titrate the mixture with 0.1 N HCl, again, to a colorless endpoint. The formaldehyde concentration of the standard may be calculated by the following equation:

$$\text{Formaldehyde, mg/mL} = \frac{\text{acid titer} \times \text{acid normality} \times 30.0}{\text{mL of Sample}}$$

(iii) This method is based on the quantitative liberation of sodium hydroxide when formaldehyde reacts with sodium sulfite to form the formaldehyde-bisulfite addition product. The volume of sample may be varied depending on the formaldehyde content but the solution to be titrated must contain excess sodium sulfite. Formaldehyde solutions containing substantial amounts of acid or base must be neutralized before analysis.

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WAC 296-62-07546 Appendix C medical surveillance—Formaldehyde. (1) Health hazards. The occupational health hazards of formaldehyde are primarily due to its toxic effects after inhalation, after direct contact with the skin or eyes by formaldehyde in liquid or vapor form, and after ingestion.

(2) Toxicology.

(a) Acute effects of exposure.

(i) Inhalation (breathing): Formaldehyde is highly irritating to the upper airways. The concentration of formaldehyde that is immediately dangerous to life and health is 100 ppm. Concentrations above 50 ppm can cause severe pulmonary reactions within minutes. These include pulmonary edema, pneumonia, and bronchial irritation which can result in death. Concentrations above 5 ppm readily cause lower airway irritation characterized by cough, chest tightness, and wheezing. There is some controversy regarding whether formaldehyde gas is a pulmonary sensitizer which can cause occupational asthma in a previously normal individual. Formaldehyde can produce symptoms of bronchial asthma in humans. The mechanism may be either sensitization of the individual by exposure to formaldehyde or direct irritation by formaldehyde in persons with preexisting asthma. Upper airway irritation is the most common respiratory effect reported by workers and can occur over a wide range of concentrations, most frequently above 1 ppm. However, airway irritation has occurred in some workers with exposures to formaldehyde as low as 0.1 ppm. Symptoms of upper airway irritation include dry or sore throat, itching and burning sensations of the nose, and nasal congestion. Tolerance to this level of exposure may develop within one to two hours. This tolerance can permit workers remaining in an environment of gradually increasing formaldehyde concentrations to be unaware of their increasingly hazardous exposure.

(ii) Eye contact: Concentrations of formaldehyde between 0.05 ppm and 0.5 ppm produce a sensation of irritation in the eyes with burning, itching, redness, and tearing. Increased rate of blinking and eye closure generally protects the eye from damage at these low levels, but these protective mechanisms may interfere with some workers' work abilities.

Tolerance can occur in workers continuously exposed to concentrations of formaldehyde in this range. Accidental splash injuries of human eyes to aqueous solutions of formaldehyde (formalin) have resulted in a wide range of ocular injuries including corneal opacities and blindness. The severity of the reactions have been directly dependent on the concentration of formaldehyde in solution and the amount of time lapsed before emergency and medical intervention.

(iii) Skin contact: Exposure to formaldehyde solutions can cause irritation of the skin and allergic contact dermatitis. These skin diseases and disorders can occur at levels well below those encountered by many formaldehyde workers. Symptoms include erythema, edema, and vesiculation or hives. Exposure to liquid formalin or formaldehyde vapor can provoke skin reactions in sensitized individuals even when airborne concentrations of formaldehyde are well below 1 ppm.

(iv) Ingestion: Ingestion of as little as 30 ml of a thirty-seven percent solution of formaldehyde (formalin) can result in death. Gastrointestinal toxicity after ingestion is most severe in the stomach and results in symptoms which can include nausea, vomiting, and severe abdominal pain. Diverse damage to other organ systems including the liver, kidney, spleen, pancreas, brain, and central nervous systems can occur from the acute response to ingestion of formaldehyde.

(b) Chronic effects of exposure. Long-term exposure to formaldehyde has been shown to be associated with an increased risk of cancer of the nose and accessory sinuses, nasopharyngeal and oropharyngeal cancer, and lung cancer in humans. Animal experiments provide conclusive evidence of a causal relationship between nasal cancer in rats and formaldehyde exposure. Concordant evidence of carcinogenicity includes DNA binding, genotoxicity in short-term tests, and cytotoxic changes in the cells of the target organ suggesting both preneoplastic changes and a dose-rate effect. Formaldehyde is a complete carcinogen and appears to exert an effect on at least two stages of the carcinogenic process.

(3) Surveillance considerations.

(a) History.

(i) Medical and occupational history: Along with its acute irritative effects, formaldehyde can cause allergic sensitization and cancer. One of the goals of the work history should be to elicit information on any prior or additional exposure to formaldehyde in either the occupational or the nonoccupational setting.

(ii) Respiratory history: As noted above, formaldehyde has recognized properties as an airway irritant and has been reported by some authors as a cause of occupational asthma. In addition, formaldehyde has been associated with cancer of the entire respiratory system of humans. For these reasons, it is appropriate to include a comprehensive review of the respiratory system in the medical history. Components of this history might include questions regarding dyspnea on exertion, shortness of breath, chronic airway complaints, hyperreactive airway disease, rhinitis, bronchitis, bronchiolitis, asthma, emphysema, respiratory allergic reaction, or other preexisting pulmonary disease.

In addition, generalized airway hypersensitivity can result from exposures to a single sensitizing agent. The exam-

iner should, therefore, elicit any prior history of exposure to pulmonary irritants, and any short-term or long-term effects of that exposure.

Smoking is known to decrease mucociliary clearance of materials deposited during respiration in the nose and upper airways. This may increase a worker's exposure to inhaled materials such as formaldehyde vapor. In addition, smoking is a potential confounding factor in the investigation of any chronic respiratory disease, including cancer. For these reasons, a complete smoking history should be obtained.

(iii) Skin disorders: Because of the dermal irritant and sensitizing effects of formaldehyde, a history of skin disorders should be obtained. Such a history might include the existence of skin irritation, previously documented skin sensitivity, and other dermatologic disorders. Previous exposure to formaldehyde and other dermal sensitizers should be recorded.

(iv) History of atopic or allergic diseases: Since formaldehyde can cause allergic sensitization of the skin and airways, it might be useful to identify individuals with prior allergen sensitization. A history of atopic disease and allergies to formaldehyde or any other substances should also be obtained. It is not definitely known at this time whether atopic diseases and allergies to formaldehyde or any other substances should also be obtained. Also it is not definitely known at this time whether atopic individuals have a greater propensity to develop formaldehyde sensitivity than the general population, but identification of these individuals may be useful for ongoing surveillance.

(v) Use of disease questionnaires: Comparison of the results from previous years with present results provides the best method for detecting a general deterioration in health when toxic signs and symptoms are measured subjectively. In this way recall bias does not affect the results of the analysis. Consequently, WISHA has determined that the findings of the medical and work histories should be kept in a standardized form for comparison of the year-to-year results.

(b) Physical examination.

(i) Mucosa of eyes and airways: Because of the irritant effects of formaldehyde, the examining physician should be alert to evidence of this irritation. A speculum examination of the nasal mucosa may be helpful in assessing possible irritation and cytotoxic changes, as may be indirect inspection of the posterior pharynx by mirror.

(ii) Pulmonary system: A conventional respiratory examination, including inspection of the thorax and auscultation and percussion of the lung fields should be performed as part of the periodic medical examination. Although routine pulmonary function testing is only required by the standard once every year for persons who are exposed over the TWA concentration limit, these tests have an obvious value in investigating possible respiratory dysfunction and should be used wherever deemed appropriate by the physician. In cases of alleged formaldehyde-induced airway disease, other possible causes of pulmonary dysfunction (including exposures to other substances) should be ruled out. A chest radiograph may be useful in these circumstances. In cases of suspected airway hypersensitivity or allergy, it may be appropriate to use bronchial challenge testing with formaldehyde or methacholine to determine the nature of the disorder. Such testing

should be performed by or under the supervision of a physician experienced in the procedures involved.

(iii) Skin: The physician should be alert to evidence of dermal irritation of sensitization, including reddening and inflammation, urticaria, blistering, scaling, formation of skin fissures, or other symptoms. Since the integrity of the skin barrier is compromised by other dermal diseases, the presence of such disease should be noted. Skin sensitivity testing carries with it some risk of inducing sensitivity, and therefore, skin testing for formaldehyde sensitivity should not be used as a routine screening test. Sensitivity testing may be indicated in the investigation of a suspected existing sensitivity. Guidelines for such testing have been prepared by the North American Contact Dermatitis Group.

(4) Additional examinations or tests. The physician may deem it necessary to perform other medical examinations or tests as indicated. The standard provides a mechanism whereby these additional investigations are covered under the standard for occupational exposure to formaldehyde.

(5) Emergencies. The examination of workers exposed in an emergency should be directed at the organ systems most likely to be affected. Much of the content of the examination will be similar to the periodic examination unless the patient has received a severe acute exposure requiring immediate attention to prevent serious consequences. If a severe overexposure requiring medical intervention or hospitalization has occurred, the physician must be alert to the possibility of delayed symptoms. Followup nonroutine examinations may be necessary to assure the patient's well-being.

(6) Employer obligations. The employer is required to provide the physician with the following information: A copy of this standard and appendices A, C, D, and E; a description of the affected employee's duties as they relate to his or her exposure concentration; an estimate of the employee's exposure including duration (e.g., fifteen hr./wk., three eight-hour shifts, full-time); a description of any personal protective equipment, including respirators, used by the employee; and the results of any previous medical determinations for the affected employee related to formaldehyde exposure to the extent that this information is within the employer's control.

(7) Physician's obligations. The standard requires the employer to obtain a written statement from the physician. This statement must contain the physician's opinion as to whether the employee has any medical condition which would place him or her at increased risk of impaired health from exposure to formaldehyde or use of respirators, as appropriate. The physician must also state his opinion regarding any restrictions that should be placed on the employee's exposure to formaldehyde or upon the use of protective clothing or equipment such as respirators. If the employee wears a respirator as a result of his or her exposure to formaldehyde, the physician's opinion must also contain a statement regarding the suitability of the employee to wear the type of respirator assigned. Finally, the physician must inform the employer that the employee has been told the results of the medical examination and of any medical conditions which require further explanation or treatment. This written opinion is not to contain any information on specific findings or diagnoses unrelated to occupational exposure to formaldehyde.

The purpose in requiring the examining physician to supply the employer with a written opinion is to provide the employer with a medical basis to assist the employer in placing employees initially, in assuring that their health is not being impaired by formaldehyde, and to assess the employee's ability to use any required protective equipment.

[Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07546, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07548 Appendix D—Nonmandatory medical disease questionnaire. (1) Identification.

- (a) Plant name:
 (b) Date:
 (c) Employee name:
 (d) Social Security number:
 (e) Job title:
 (f) Birthdate:
 (g) Age:
 (h) Sex:
 (i) Height:
 (j) Weight:
 (2) Medical history.
 (a) Have you ever been in the hospital as a patient?
 Yes No
 If yes, what kind of problem were you having?
- (b) Have you ever had any kind of operation?
 Yes No
 If yes, what kind?
- (c) Do you take any kind of medicine regularly?
 Yes No
 If yes, what kind?
- (d) Are you allergic to any drugs, foods, or chemicals?
 Yes No
 If yes, what kind of allergy is it?
 What causes the allergy?
- (e) Have you ever been told that you have asthma, hayfever, or sinusitis?
 Yes No
- (f) Have you ever been told that you have emphysema, bronchitis, or any other respiratory problems?
 Yes No
- (g) Have you ever been told you had hepatitis?
 Yes No
- (h) Have you ever been told that you have cirrhosis?
 Yes No
- (i) Have you ever been told that you had cancer?
 Yes No
- (j) Have you ever had arthritis or joint pain?
 Yes No
- (k) Have you ever been told that you had high blood pressure?
 Yes No
- (l) Have you ever had a heart attack or heart trouble?
 Yes No
- (3) Medical history update.
 (a) Have you been in the hospital as a patient any time within the past year?
 Yes No
 If so, for what condition?
- (b) Have you been under the care of a physician during the past year?
 Yes No
 If so, for what condition?
- (c) Is there any change in your breathing since last year?
 Yes No
 (i) Better?
 (ii) Worse?
 (iii) No change?
 If change, do you know why?
- (d) Is your general health different this year from last year?
 Yes No
 If different, in what way?
- (e) Have you in the past year or are you now taking any medication on a regular basis?
 Yes No
 (i) Name Rx
 (ii) Condition being treated
- (4) Occupational history.
 (a) How long have you worked for your present employer?
- (b) What jobs have you held with this employer? Include job title and length of time in each job.
- (c) In each of these jobs, how many hours a day were you exposed to chemicals?
- (d) What chemicals have you worked with most of the time?

- (e) Have you ever noticed any type of skin rash you feel was related to your work?
Yes No
- (f) Have you ever noticed that any kind of chemical makes you cough?
Yes No
(i) Wheeze:
Yes No
(ii) Become short of breath or cause your chest to become tight?
Yes No
- (g) Are you exposed to any dust or chemicals at home?
Yes No
If yes, explain:
- (h) In other jobs, have you ever had exposure to:
(i) Wood dust?
Yes No
(ii) Nickel or chromium?
Yes No
(iii) Silica (foundry, sand blasting)?
Yes No
(iv) Arsenic or asbestos?
Yes No
(v) Organic solvents?
Yes No
(vi) Urethane foams?
Yes No
- (5) Occupational history update.
(a) Are you working on the same job this year as you were last year?
Yes No
If not, how has your job changed?
- (b) What chemicals are you exposed to on your job?
- (c) How many hours a day are you exposed to chemicals?
- (d) Have you noticed any skin rash within the past year you feel was related to your work?
Yes No
If so, explain circumstances:
- (e) Have you noticed that any chemical makes you cough, be short of breath, or wheeze?
Yes No
If so, can you identify it?
- (6) Miscellaneous.
(a) Do you smoke?
Yes No
If so, how much and for how long?
(i) Pipe
(ii) Cigars
(iii) Cigarettes
(b) Do you drink alcohol in any form?
Yes No
If so, how much, how long, and how often?
- (c) Do you wear glasses or contact lenses?
Yes No
- (d) Do you get any physical exercise other than that required to do your job?
Yes No
If so, explain:
- (e) Do you have any hobbies or "side jobs" that require you to use chemicals, such as furniture stripping, sand blasting, insulation or manufacture of urethane foam, furniture, etc.?
Yes No
If so, please describe, giving type of business or hobby, chemicals used and length of exposures.
- (7) Symptoms questionnaire.
(a) Do you ever have any shortness of breath?
Yes No
(i) If yes, do you have to rest after climbing several flights of stairs?
Yes No
(ii) If yes, if you walk on the level with people your own age, do you walk slower than they do?
Yes No
(iii) If yes, if you walk slower than a normal pace, do you have to limit the distance that you walk?
Yes No
(iv) If yes, do you have to stop and rest while bathing or dressing?
Yes No
- (b) Do you cough as much as three months out of the year?
Yes No
(i) If yes, have you had this cough for more than two years?
Yes No
(ii) If yes, do you ever cough anything up from the chest?
Yes No

- (c) Do you ever have a feeling of smothering, unable to take a deep breath, or tightness in your chest?
Yes No
- (i) If yes, do you notice that this occurs on any particular day of the week?
Yes No
- (ii) If yes, what day of the week?
- (iii) If yes, do you notice that this occurs at any particular place?
Yes No
- (iv) If yes, do you notice that this is worse after you have returned to work after being off for several days?
Yes No
- (d) Have you ever noticed any wheezing in your chest?
Yes No
- (i) If yes, is this only with colds or other infections?
Yes No
- (ii) Is this caused by exposure to any kind of dust or other material?
Yes No
- (iii) If yes, what kind?
- (e) Have you noticed any burning, tearing, or redness of your eyes when you are at work?
Yes No
If so, explain circumstances:
- (f) Have you noticed any sore or burning throat or itchy or burning nose when you are at work?
Yes No
If so, explain circumstances:
- (g) Have you noticed any stuffiness or dryness of your nose?
Yes No
- (h) Do you ever have swelling of the eyelids or face?
Yes No
- (i) Have you ever been jaundiced?
Yes No
If yes, was this accompanied by any pain?
Yes No
- (j) Have you ever had a tendency to bruise easily or bleed excessively?
Yes No
- (k) Do you have frequent headaches that are not relieved by aspirin or tylenol?
Yes No
- (i) If yes, do they occur at any particular time of the day or week?
Yes No
- (ii) If yes, when do they occur?
- (l) Do you have frequent episodes of nervousness or irritability?
Yes No
- (m) Do you tend to have trouble concentrating or remembering?
Yes No
- (n) Do you ever feel dizzy, light-headed, excessively drowsy, or like you have been drugged?
Yes No
- (o) Does your vision ever become blurred?
Yes No
- (p) Do you have numbness or tingling of the hands or feet or other parts of your body?
Yes No
- (q) Have you ever had chronic weakness or fatigue?
Yes No
- (r) Have you ever had any swelling of your feet or ankles to the point where you could not wear your shoes?
Yes No
- (s) Are you bothered by heartburn or indigestion?
Yes No
- (t) Do you ever have itching, dryness, or peeling and scaling of the hands?
Yes No
- (u) Do you ever have a burning sensation in the hands, or reddening of the skin?
Yes No
- (v) Do you ever have cracking or bleeding of the skin on your hands?
Yes No
- (w) Are you under a physician's care?
Yes No
If yes, for what are you being treated?
- (x) Do you have any physical complaints today?
Yes No
If yes, explain:
- (y) Do you have other health conditions not covered by these questions?
Yes No
If yes, explain:

[Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07548, filed 10/6/88, effective 11/7/88.]

WAC 296-62-076 Methylenedianiline.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-076, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07601 Scope and application. (1) WAC 296-62-076 applies to all occupational exposures to MDA, Chemical Abstracts Service Registry No. 101-77-9, except as provided in subsections (2) through (7) of this section.

(2) Except as provided in subsection (8) of this section and WAC 296-62-07609(5), this section does not apply to the processing, use, and handling of products containing MDA where initial monitoring indicates that the product is not

capable of releasing MDA in excess of the action level under the expected conditions of processing, use, and handling which will cause the greatest possible release; and where no "dermal exposure to MDA" can occur.

(3) Except as provided in subsection (8) of this section, WAC 296-62-076 does not apply to the processing, use, and handling of products containing MDA where objective data are reasonably relied upon which demonstrate the product is not capable of releasing MDA under the expected conditions of processing, use, and handling which will cause the greatest possible release; and where no "dermal exposure to MDA" can occur.

(4) WAC 296-62-076 does not apply to the storage, transportation, distribution, or sale of MDA in intact containers sealed in such a manner as to contain the MDA dusts, vapors, or liquids, except for the provisions of WAC 296-62-054 and 296-62-07607.

(5) WAC 296-62-076 does not apply to the construction industry as defined in WAC 296-155-012(6). (Exposure to MDA in the construction industry is covered by WAC 296-155-173.)

(6) Except as provided in subsection (8) of this section, WAC 296-62-076 does not apply to materials in any form which contain less than 0.1% MDA by weight or volume.

(7) Except as provided in subsection (8) of this section, WAC 296-62-076 does not apply to "finished articles containing MDA."

(8) Where products containing MDA are exempted under subsections (2) through (7) of this section, the employer shall maintain records of the initial monitoring results or objective data supporting that exemption and the basis for the employer's reliance on the data, as provided in the recordkeeping provision of WAC 296-62-07631.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07601, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07603 Definitions. For the purpose of WAC 296-62-076, the following definitions shall apply:

(1) "Action level" means a concentration of airborne MDA of 5 ppb as an 8-hour time-weighted average.

(2) "Authorized person" means any person specifically authorized by the employer whose duties require the person to enter a regulated area, or any person entering such an area as a designated representative of employees, for the purpose of exercising the right to observe monitoring and measuring procedures under WAC 296-62-07633 of WAC 296-62-076, or any other person authorized by WISHA or regulations issued by WISHA.

(3) "Container" means any barrel, bottle, can, cylinder, drum, reaction vessel, storage tank, commercial packaging, or the like, but does not include piping systems.

(4) "Dermal exposure to MDA" occurs where employees are engaged in the handling, application, or use of mixtures or materials containing MDA, with any of the following nonairborne forms of MDA:

(a) Liquid, powdered, granular, or flaked mixtures containing MDA in concentrations greater than 0.1% by weight or volume; and

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(b) Materials other than "finished articles" containing MDA in concentrations greater than 0.1% by weight or volume.

(5) "Director" means the director of the department of labor and industries, or his/her designated representative.

(6) "Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which results in an unexpected and potentially hazardous release of MDA.

(7) "Employee exposure" means exposure to MDA which would occur if the employee were not using respirators or protective work clothing and equipment.

(8) "Finished article containing MDA" is defined as a manufactured item:

(a) Which is formed to a specific shape or design during manufacture;

(b) Which has end use function(s) dependent in whole or part upon its shape or design during end use; and

(c) Where applicable, is an item which is fully cured by virtue of having been subjected to the conditions (temperature, time) necessary to complete the desired chemical reaction.

(9) "4,4' methylenedianiline" or "MDA" means the chemical 4,4'-diaminodiphenylmethane, Chemical Abstract Service Registry number 101-77-9, in the form of a vapor, liquid, or solid. The definition also includes the salts of MDA.

(10) "Regulated areas" means areas where airborne concentrations of MDA exceed or can reasonably be expected to exceed, the permissible exposure limits, or where dermal exposure to MDA can occur.

(11) "STEL" means short-term exposure limit as determined by any 15 minute sample period.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07603, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07605 Permissible exposure limits (PEL). The employer shall assure that no employee is exposed to an airborne concentration of MDA in excess of ten parts per billion (10 ppb) as an 8-hour time-weighted average or a STEL of 100 ppb.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07605, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07607 Emergency situations. (1) Written plan.

(a) A written plan for emergency situations shall be developed for each workplace where there is a possibility of an emergency. Appropriate portions of the plan shall be implemented in the event of an emergency.

(b) The plan shall specifically provide that employees engaged in correcting emergency conditions shall be equipped with the appropriate personal protective equipment and clothing as required in WAC 296-62-07615 and 296-62-07617 until the emergency is abated.

(c) The plan shall specifically include provisions for alerting and evacuating affected employees as well as the elements prescribed in chapter 296-24 WAC, Part G-1, "Employee emergency plans and fire prevention plans."

(2001 Ed.)

(2) Alerting employees. Where there is the possibility of employee exposure to MDA due to an emergency, means shall be developed to alert promptly those employees who have the potential to be directly exposed. Affected employees not engaged in correcting emergency conditions shall be evacuated immediately in the event that an emergency occurs. Means shall also be developed and implemented for alerting other employees who may be exposed as a result of the emergency.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07607, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07609 Exposure monitoring. (1) General.

(a) Determinations of employee exposure shall be made from breathing zone air samples that are representative of each employee's exposure to airborne MDA over an 8-hour period. Determination of employee exposure to the STEL shall be made from breathing zone air samples collected over a 15 minute sampling period.

(b) Representative employee exposure shall be determined on the basis of one or more samples representing full shift exposure for each shift for each job classification in each work area where exposure to MDA may occur.

(c) Where the employer can document that exposure levels are equivalent for similar operations in different work shifts, the employer shall only be required to determine representative employee exposure for that operation during one shift.

(2) Initial monitoring. Each employer who has a workplace or work operation covered by this standard shall perform initial monitoring to determine accurately the airborne concentrations of MDA to which employees may be exposed.

(3) Periodic monitoring and monitoring frequency.

(a) If the monitoring required by subsection (2) of this section reveals employee exposure at or above the action level, but at or below the PELs, the employer shall repeat such representative monitoring for each such employee at least every six months.

(b) If the monitoring required by subsection (2) of this section reveals employee exposure above the PELs, the employer shall repeat such monitoring for each such employee at least every three months.

(c) The employer may alter the monitoring schedule from every three months to every six months for any employee for whom two consecutive measurements taken at least 7 days apart indicate that the employee exposure has decreased to below the TWA but above the action level.

(4) Termination of monitoring.

(a) If the initial monitoring required by subsection (2) of this section reveals employee exposure to be below the action level, the employer may discontinue the monitoring for that employee, except as otherwise required by subsection (5) of this section.

(b) If the periodic monitoring required by subsection (3) of this section reveals that employee exposures, as indicated by at least two consecutive measurements taken at least 7 days apart, are below the action level the employer may discontinue the monitoring for that employee, except as otherwise required by subsection (5) of this section.

(2001 Ed.)

(5) Additional monitoring. The employer shall institute the exposure monitoring required under subsections (2) and (3) of this section when there has been a change in production process, chemicals present, control equipment, personnel, or work practices which may result in new or additional exposures to MDA, or when the employer has any reason to suspect a change which may result in new or additional exposures.

(6) Accuracy of monitoring. Monitoring shall be accurate, to a confidence level of 95 percent, to within plus or minus 25 percent for airborne concentrations of MDA.

(7) Employee notification of monitoring results.

(a) The employer shall, within 15 working days after the receipt of the results of any monitoring performed under this standard, notify each employee of these results, in writing, either individually or by posting of results in an appropriate location that is accessible to affected employees.

(b) The written notification required by subdivision (a) of this subsection shall contain the corrective action being taken by the employer to reduce the employee exposure to or below the PELs, wherever the PELs are exceeded.

(8) Visual monitoring. The employer shall make routine inspections of employee hands, face, and forearms potentially exposed to MDA. Other potential dermal exposures reported by the employee must be referred to the appropriate medical personnel for observation. If the employer determines that the employee has been exposed to MDA the employer shall:

(a) Determine the source of exposure;

(b) Implement protective measures to correct the hazard; and

(c) Maintain records of the corrective actions in accordance with WAC 296-62-07631.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07609, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07611 Regulated areas. (1) Establishment.

(a) Airborne exposures. The employer shall establish regulated areas where airborne concentrations of MDA exceed or can reasonably be expected to exceed, the permissible exposure limits.

(b) Dermal exposures. Where employees are subject to dermal exposure to MDA the employer shall establish those work areas as regulated areas.

(2) Demarcation. Regulated areas shall be demarcated from the rest of the workplace in a manner that minimizes the number of persons potentially exposed.

(3) Access. Access to regulated areas shall be limited to authorized persons.

(4) Personal protective equipment and clothing. Each person entering a regulated area shall be supplied with, and required to use, the appropriate personal protective clothing and equipment in accordance with WAC 296-62-07615 and 296-62-07617.

(5) Prohibited activities. The employer shall ensure that employees do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07611, filed 2/3/93, effective 3/15/93.]

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WAC 296-62-07613 Methods of compliance. (1) Engineering controls and work practices.

(a) The employer shall institute engineering controls and work practices to reduce and maintain employee exposure to MDA at or below the PELs except to the extent that the employer can establish that these controls are not feasible or where the provisions of subdivision (b) of this subsection or WAC 296-62-07615(1) apply.

(b) Wherever the feasible engineering controls and work practices which can be instituted are not sufficient to reduce employee exposure to or below the PELs, the employer shall use them to reduce employee exposure to the lowest levels achievable by these controls and shall supplement them by the use of respiratory protective devices which comply with the requirements of WAC 296-62-07615.

(2) Compliance program.

(a) The employer shall establish and implement a written program to reduce employee exposure to or below the PELs by means of engineering and work practice controls, as required by subsection (1) of this section, and by use of respiratory protection where permitted under WAC 296-62-076. The program shall include a schedule for periodic maintenance (e.g., leak detection) and shall include the written plan for emergency situations as specified in WAC 296-62-07607.

(b) Upon request this written program shall be furnished for examination and copying to the director, affected employees, and designated employee representatives. The employer shall review and, as necessary, update such plans at least once every 12 months to make certain they reflect the current status of the program.

(3) Employee rotation. Employee rotation shall not be permitted as a means of reducing exposure.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07613, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07615 Respiratory protection. (1) General. For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this subsection. Respirators must be used during:

(a) Periods necessary to install or implement feasible engineering and work-practice controls;

(b) Work operations for which the employer establishes that engineering and work-practice controls are not feasible;

(c) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce exposure to or below the PEL;

(d) Emergencies.

(2) Respirator program. The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(3) Respirator selection.

(a) The employer must select, and ensure that employees use, the appropriate respirator from Table 1 of this section.

Table 1.—Respiratory Protection for MDA

Airborne concentration of MDA or condition of use	Respirator type
a. Less than or equal to 10xPEL	(1) Half-mask respirator with HEPA ¹ cartridge ² .

Table 1.—Respiratory Protection for MDA

b. Less than or equal to 50xPEL	(1) Full facepiece respirator with HEPA ¹ cartridge or canister ² .
c. Less than or equal to 1000xPEL	(1) Full facepiece powered air-purifying respirator with HEPA ¹ cartridges ² .
d. Greater than 1000xPEL or	(1) Self-contained breathing unknown concentrations apparatus with full facepiece in positive pressure mode;
	(2) Full facepiece positive pressure demand supplied-air respirator with auxiliary self-contained air supply.
e. Escape	(1) Any full facepiece air-purifying respirator with HEPA ¹ cartridges ² ;
	(2) Any positive pressure or continuous flow self-contained breathing apparatus with full facepiece or hood.
f. Fire fighting	(1) Full facepiece self-contained breathing apparatus in positive pressure demand mode.

Note: Respirators assigned for higher environmental concentrations may be used at lower concentrations.

¹ High efficiency particulate in air filter (HEPA) means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers or larger.

² Combination HEPA/organic vapor cartridges shall be used whenever MDA in liquid form or a process requiring heat is used.

(b) Any employee who cannot use a negative-pressure respirator must be given the option of using a positive-pressure respirator, or a supplied-air respirator operated in the continuous-flow or pressure-demand mode.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07615, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07615, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07617 Protective work clothing and equipment. (1) Provision and use. Where employees are subject to dermal exposure to MDA, where liquids containing MDA can be splashed into the eyes, or where airborne concentrations of MDA are in excess of the PEL, the employer shall provide, at no cost to the employee, and ensure that the employee uses, appropriate protective work clothing and equipment which prevent contact with MDA such as, but not limited to:

(a) Aprons, coveralls, or other full-body work clothing;

(b) Gloves, head coverings, and foot coverings; and

(c) Face shields, chemical goggles; or

(d) Other appropriate protective equipment which comply with chapter 296-24 WAC, Part A-2.

(2) Removal and storage.

(a) The employer shall ensure that, at the end of their work shift, employees remove MDA-contaminated protective work clothing and equipment that is not routinely removed throughout the day in change rooms provided in accordance with the provisions established for change rooms.

(b) The employer shall ensure that, during their work shift, employees remove all other MDA-contaminated protective work clothing or equipment before leaving a regulated area.

(c) The employer shall ensure that no employee takes MDA-contaminated work clothing or equipment out of the change room, except those employees authorized to do so for the purpose of laundering, maintenance, or disposal.

(d) MDA-contaminated work clothing or equipment shall be placed and stored in closed containers which prevent dispersion of the MDA outside the container.

(e) Containers of MDA-contaminated protective work clothing or equipment which are to be taken out of change rooms or the workplace for cleaning, maintenance, or disposal shall bear labels warning of the hazards of MDA.

(3) Cleaning and replacement.

(a) The employer shall provide the employee with clean protective clothing and equipment. The employer shall ensure that protective work clothing or equipment required by this paragraph is cleaned, laundered, repaired, or replaced at intervals appropriate to maintain its effectiveness.

(b) The employer shall prohibit the removal of MDA from protective work clothing or equipment by blowing, shaking, or any methods which allow MDA to reenter the workplace.

(c) The employer shall ensure that laundering of MDA-contaminated clothing shall be done so as to prevent the release of MDA in the workplace.

(d) Any employer who gives MDA-contaminated clothing to another person for laundering shall inform such person of the requirement to prevent the release of MDA.

(e) The employer shall inform any person who launders or cleans protective clothing or equipment contaminated with MDA of the potentially harmful effects of exposure.

(f) MDA-contaminated clothing shall be transported in properly labeled, sealed, impermeable bags or containers.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-62-07617, filed 9/30/94, effective 11/20/94; 93-04-111 (Order 92-15), § 296-62-07617, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07619 Hygiene facilities and practices.

(1) Change rooms.

(a) The employer shall provide clean change rooms for employees, who must wear protective clothing, or who must use protective equipment because of their exposure to MDA.

(b) Change rooms must be equipped with separate storage for protective clothing and equipment and for street clothes which prevents MDA contamination of street clothes.

(2) Showers.

(a) The employer shall ensure that employees, who work in areas where there is the potential for exposure resulting from airborne MDA (e.g., particulates or vapors) above the action level, shower at the end of the work shift.

(i) Shower facilities required by this section shall comply with WAC 296-24-12009(3).

(ii) The employer shall ensure that employees who are required to shower pursuant to the provisions contained herein do not leave the workplace wearing any protective clothing or equipment worn during the work shift.

(b) Where dermal exposure to MDA occurs, the employer shall ensure that materials spilled or deposited on the skin are removed as soon as possible by methods which do not facilitate the dermal absorption of MDA.

(3) Lunch facilities.

(a) Availability and construction.

(i) Whenever food or beverages are consumed at the worksite and employees are exposed to MDA at or above the PEL or are subject to dermal exposure to MDA the employer shall provide readily accessible lunch areas.

(ii) Lunch areas located within the workplace and in areas where there is the potential for airborne exposure to MDA at or above the PEL shall have a positive pressure, temperature controlled, filtered air supply.

(iii) Lunch areas may not be located in areas within the workplace where the potential for dermal exposure to MDA exists.

(b) The employer shall ensure that employees who have been subjected to dermal exposure to MDA or who have been exposed to MDA above the PEL wash their hands and faces with soap and water prior to eating, drinking, smoking, or applying cosmetics.

(c) The employer shall ensure that employees exposed to MDA do not enter lunch facilities with MDA-contaminated protective work clothing or equipment.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07619, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07621 Communication of hazards to employees. (1) Signs and labels.

(a) The employer shall post and maintain legible signs demarcating regulated areas and entrances or accessways to regulated areas that bear the following legend:

DANGER MDA MAY CAUSE CANCER LIVER TOXIN
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING
MAY BE REQUIRED TO BE WORN IN THIS AREA

(b) The employer shall ensure that labels or other appropriate forms of warning are provided for containers of MDA within the workplace. The labels shall comply with the requirements of WAC 296-62-05411 and shall include the following legend:

(i) For pure MDA

DANGER CONTAINS MDA MAY CAUSE CANCER LIVER TOXIN

(ii) For mixtures containing MDA

DANGER CONTAINS MDA CONTAINS MATERIALS
WHICH MAY CAUSE CANCER LIVER TOXIN

(2) Material safety data sheets (MSDS).

(a) Employers shall obtain or develop, and shall provide access to their employees, to a material safety data sheet (MSDS) for MDA. In meeting this obligation, employers shall make appropriate use of the information found in Appendices A and B.

(b) Employers who are manufacturers or importers shall:

(i) Comply with subdivision (1)(b) of this section as appropriate; and

(ii) Comply with the requirement in WISHA hazard communication standard, WAC 296-62-054, that they deliver to downstream employers an MSDS for MDA.

(3) Information and training.

(a) The employer shall provide employees with information and training on MDA, in accordance with WAC 296-62-054 through 296-62-05415, at the time of initial assignment and at least annually thereafter.

(b) In addition to the information required under WAC 296-62-054, the employer shall:

(i) Provide an explanation of the contents of WAC 296-62-076, including Appendices A and B, and indicate to employees where a copy of the standard is available;

(ii) Describe the medical surveillance program required under WAC 296-62-07625, and explain the information contained in Appendix C; and

(iii) Describe the medical removal provision required under WAC 296-62-07625.

(4) Access to training materials.

(a) The employer shall make readily available to all affected employees, without cost, all written materials relating to the employee training program, including a copy of this regulation.

(b) The employer shall provide to the director, upon request, all information and training materials relating to the employee information and training program.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07621, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07623 Housekeeping. (1) All surfaces shall be maintained as free as practicable of visible accumulations of MDA.

(2) The employer shall institute a program for detecting MDA leaks, spills, and discharges, including regular visual inspections of operations involving liquid or solid MDA.

(3) All leaks shall be repaired and liquid or dust spills cleaned up promptly.

(4) Surfaces contaminated with MDA may not be cleaned by the use of compressed air.

(5) Shoveling, dry sweeping, and other methods of dry clean-up of MDA may be used where HEPA-filtered vacuuming and/or wet cleaning are not feasible or practical.

(6) Waste, scrap, debris, bags, containers, equipment, and clothing contaminated with MDA shall be collected and disposed of in a manner to prevent the reentry of MDA into the workplace.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07623, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07625 Medical surveillance. (1) General.

(a) The employer shall make available a medical surveillance program for employees exposed to MDA:

(i) Employees exposed at or above the action level for 30 or more days per year;

(ii) Employees who are subject to dermal exposure to MDA for 15 or more days per year;

(iii) Employees who have been exposed in an emergency situation;

(iv) Employees whom the employer, based on results from compliance with WAC 296-62-07609(8), has reason to believe are being dermally exposed; and

(v) Employees who show signs or symptoms of MDA exposure.

(b) The employer shall ensure that all medical examinations and procedures are performed by, or under the supervision of, a licensed physician, at a reasonable time and place, and provided without cost to the employee.

(2) Initial examinations.

(a) Within 150 days of the effective date of this standard, or before the time of initial assignment, the employer shall provide each employee covered by subdivision (1)(a) of this section with a medical examination including the following elements:

(i) A detailed history which includes:

(A) Past work exposure to MDA or any other toxic substances;

(B) A history of drugs, alcohol, tobacco, and medication routinely taken (duration and quantity); and

(C) A history of dermatitis, chemical skin sensitization, or previous hepatic disease.

(ii) A physical examination which includes all routine physical examination parameters, skin examination, and signs of liver disease.

(iii) Laboratory tests including:

(A) Liver function tests; and

(B) Urinalysis.

(iv) Additional tests as necessary in the opinion of the physician.

(b) No initial medical examination is required if adequate records show that the employee has been examined in accordance with the requirements of WAC 296-62-076 within the previous six months prior to the effective date of this standard or prior to the date of initial assignment.

(3) Periodic examinations.

(a) The employer shall provide each employee covered by WAC 296-62-076 with a medical examination at least annually following the initial examination. These periodic examinations shall include at least the following elements:

(i) A brief history regarding any new exposure to potential liver toxins, changes in drug, tobacco, and alcohol intake, and the appearance of physical signs relating to the liver and the skin;

(ii) The appropriate tests and examinations including liver function tests and skin examinations; and

(iii) Appropriate additional tests or examinations as deemed necessary by the physician.

(b) If in the physicians' opinion the results of liver function tests indicate an abnormality, the employee shall be removed from further MDA exposure in accordance with WAC 296-62-07627 and 296-62-07629. Repeat liver function tests shall be conducted on advice of the physician.

(4) Emergency examinations. If the employer determines that the employee has been exposed to a potentially hazardous amount of MDA in an emergency situation as addressed in WAC 296-62-07607, the employer shall provide medical examinations in accordance with subsection (3) of this section. If the results of liver function testing indicate an abnormality, the employee shall be removed in accordance with WAC 296-62-07627 and 296-62-07629. Repeat liver function tests shall be conducted on the advice of the physician. If the results of the tests are normal, tests must be repeated two to three weeks from the initial testing. If the

results of the second set of tests are normal and on the advice of the physician, no additional testing is required.

(5) Additional examinations. Where the employee develops signs and symptoms associated with exposure to MDA, the employer shall provide the employee with an additional medical examination including a liver function test. Repeat liver function tests shall be conducted on the advice of the physician. If the results of the tests are normal, tests must be repeated two to three weeks from the initial testing. If the results of the second set of tests are normal and, on the advice of the physician, no additional testing is required.

(6) Multiple physician review mechanism.

(a) If the employer selects the initial physician who conducts any medical examination or consultation provided to an employee under WAC 296-62-076, and the employee has signs or symptoms of occupational exposure to MDA (which could include an abnormal liver function test), and the employee disagrees with the opinion of the examining physician, and this opinion could affect the employee's job status, the employee may designate an appropriate, mutually acceptable second physician:

(i) To review any findings, determinations, or recommendations of the initial physician; and

(ii) To conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.

(b) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation pursuant to WAC 296-62-076. The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen days after receipt of the foregoing notification, or receipt of the initial physician's written opinion, whichever is later:

(i) The employee informing the employer that he or she intends to seek a second medical opinion; and

(ii) The employee initiating steps to make an appointment with a second physician.

(c) If the findings, determinations, or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve any disagreement.

(d) If the two physicians have been unable to resolve quickly their disagreement, then the employer and the employee through their respective physicians shall designate a third physician:

(i) To review any findings, determinations, or recommendations of the prior physicians; and

(ii) To conduct such examinations, consultations, laboratory tests, and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

(e) The employer shall act consistent with the findings, determinations, and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(2001 Ed.)

(7) Information provided to the examining and consulting physicians.

(a) The employer shall provide the following information to the examining physician:

(i) A copy of this regulation and its appendices;

(ii) A description of the affected employee's duties as they relate to the employee's potential exposure to MDA;

(iii) The employee's current actual or representative MDA exposure level;

(iv) A description of any personal protective equipment used or to be used; and

(v) Information from previous employment-related medical examinations of the affected employee.

(b) The employer shall provide the foregoing information to a second physician under this section upon request either by the second physician or by the employee.

(8) Physician's written opinion.

(a) For each examination under WAC 296-62-076, the employer shall obtain, and provide the employee with a copy of, the examining physician's written opinion within 15 days of its receipt. The written opinion shall include the following:

(i) The occupationally-pertinent results of the medical examination and tests;

(ii) The physician's opinion concerning whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of health from exposure to MDA;

(iii) The physician's recommended limitations upon the employee's exposure to MDA or upon the employee's use of protective clothing or equipment and respirators; and

(iv) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions resulting from MDA exposure which require further explanation or treatment.

(b) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposures.

[Statutory Authority: Chapter 49.17 RCW, 93-04-111 (Order 92-15), § 296-62-07625, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07627 Medical removal—Temporary medical removal of an employee. Temporary medical removal of an employee.

(1) Temporary removal resulting from occupational exposure. The employee shall be removed from work environments in which exposure to MDA is at or above the action level or where dermal exposure to MDA may occur, following an initial examination (WAC 296-62-07625(2)), periodic examinations (WAC 296-62-07625(3)), an emergency situation (WAC 296-62-07625(4)), or an additional examination (WAC 296-62-07625(5)) in the following circumstances:

(a) When the employee exhibits signs and/or symptoms indicative of acute exposure to MDA; or

(b) When the examining physician determines that an employee's abnormal liver function tests are not associated with MDA exposure but that the abnormalities may be exacerbated as a result of occupational exposure to MDA.

(c) Temporary removal due to a final medical determination.

[Title 296 WAC—p. 1657]

(i) The employer shall remove an employee from work environments in which exposure to MDA is at or above the action level or where dermal exposure to MDA may occur, on each occasion that there is a final medical determination or opinion that the employee has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to MDA.

(ii) For the purposes of WAC 296-62-076, the phrase "final medical determination" shall mean the outcome of the physician review mechanism used pursuant to the medical surveillance provisions of this section.

(iii) Where a final medical determination results in any recommended special protective measures for an employee, or limitations on an employee's exposure to MDA, the employer shall implement and act consistent with the recommendation.

(2) Return of the employee to former job status.

(a) The employer shall return an employee to his or her former job status:

(i) When the employee no longer shows signs or symptoms of exposure to MDA or upon the advice of the physician.

(ii) When a subsequent final medical determination results in a medical finding, determination, or opinion that the employee no longer has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to MDA.

(b) For the purposes of this section, the requirement that an employer return an employee to his or her former job status is not intended to expand upon or restrict any rights an employee has or would have had, absent temporary medical removal, to a specific job classification or position under the terms of a collective bargaining agreement.

(3) Removal of other employee special protective measure or limitations. The employer shall remove any limitations placed on an employee, or end any special protective measures provided to an employee, pursuant to a final medical determination, when a subsequent final medical determination indicates that the limitations or special protective measures are no longer necessary.

(4) Employer options pending a final medical determination. Where the physician review mechanism used pursuant to the medical surveillance provisions of WAC 296-62-076, has not yet resulted in a final medical determination with respect to an employee, the employer shall act as follows:

(a) Removal. The employer may remove the employee from exposure to MDA, provide special protective measures to the employee, or place limitations upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status.

(b) Return. The employer may return the employee to his or her former job status, and end any special protective measures provided to the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status, with two exceptions.

(i) If the initial removal, special protection, or limitation of the employee resulted from a final medical determination

which differed from the findings, determinations, or recommendations of the initial physician; or

(ii) If the employee has been on removal status for the preceding six months as a result of exposure to MDA, then the employer shall await a final medical determination.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07627, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07629 Medical removal protection benefits. (1) Provisions of medical removal protection benefits. The employer shall provide to an employee up to six months of medical removal protection benefits on each occasion that an employee is removed from exposure to MDA or otherwise limited pursuant to this section.

(2) Definition of medical removal protection benefits. For the purposes of this section, the requirement that an employer provide medical removal protection benefits means that the employer shall maintain the earnings, seniority, and other employment rights and benefits of an employee as though the employee had not been removed from normal exposure to MDA or otherwise limited.

(3) Follow-up medical surveillance during the period of employee removal or limitations. During the period of time that an employee is removed from normal exposure to MDA or otherwise limited, the employer may condition the provision of medical removal protection benefits upon the employee's participation in follow-up medical surveillance made available pursuant to WAC 296-62-076.

(4) Workers' compensation claims. If a removed employee files a claim for workers' compensation payments for an MDA-related disability, then the employer shall continue to provide medical removal protection benefits pending disposition of the claim. To the extent that an award is made to the employee for earnings lost during the period of removal, the employer's medical removal protection obligation shall be reduced by such amount. The employer shall receive no credit for workers' compensation payments received by the employee for treatment-related expenses.

(5) Other credits. The employer's obligation to provide medical removal protection benefits to a removed employee shall be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program, or receives income from non-MDA-related employment with any employer made possible by virtue of the employee's removal.

(6) Employees who do not recover within the 6 months of removal. The employer shall take the following measures with respect to any employee removed from exposure to MDA:

(a) The employer shall make available to the employee a medical examination pursuant to this section to obtain a final medical determination with respect to the employee;

(b) The employer shall assure that the final medical determination obtained indicates whether or not the employee may be returned to his or her former job status, and, if not, what steps should be taken to protect the employee's health;

(c) Where the final medical determination has not yet been obtained, or, once obtained indicates that the employee

may not yet be returned to his or her former job status, the employer shall continue to provide medical removal protection benefits to the employee until either the employee is returned to former job status, or a final medical determination is made that the employee is incapable of ever safely returning to his or her former job status; and

(d) Where the employer acts pursuant to a final medical determination which permits the return of the employee to his or her former job status, despite what would otherwise be an abnormal liver function test, later questions concerning removing the employee again shall be decided by a final medical determination. The employer need not automatically remove such an employee pursuant to the MDA removal criteria provided by WAC 296-62-076.

(7) Voluntary removal or restriction of an employee. Where an employer, although not required by WAC 296-62-076 to do so, removes an employee from exposure to MDA or otherwise places limitations on an employee due to the effects of MDA exposure on the employee's medical condition, the employer shall provide medical removal protection benefits to the employee equal to that required by this section.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07629, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07631 Recordkeeping. (1) Monitoring data for exempted employers.

(a) Where as a result of the initial monitoring the processing, use, or handling of products made from or containing MDA are exempted from other requirements of this section under WAC 296-62-07601(2), the employer shall establish and maintain an accurate record of monitoring relied on in support of the exemption.

(b) This record shall include at least the following information:

- (i) The product qualifying for exemption;
- (ii) The source of the monitoring data (e.g., was monitoring performed by the employer or a private contractor);
- (iii) The testing protocol, results of testing, and/or analysis of the material for the release of MDA;
- (iv) A description of the operation exempted and how the data support the exemption (e.g., are the monitoring data representative of the conditions at the affected facility); and
- (v) Other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.

(c) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

(2) Objective data for exempted employers.

(a) Where the processing, use, or handling of products made from or containing MDA are exempted from other requirements of WAC 296-62-076 under WAC 296-62-07601, the employer shall establish and maintain an accurate record of objective data relied upon in support of the exemption.

(b) This record shall include at least the following information:

- (i) The product qualifying for exemption;
- (ii) The source of the objective data;
- (iii) The testing protocol, results of testing, and/or analysis of the material for the release of MDA;

(iv) A description of the operation exempted and how the data support the exemption; and

(v) Other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.

(c) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

(3) Exposure measurements.

(a) The employer shall establish and maintain an accurate record of all measurements required by WAC 296-62-07609, in accordance with Part B of this chapter.

(b) This record shall include:

(i) The dates, number, duration, and results of each of the samples taken, including a description of the procedure used to determine representative employee exposures;

(ii) Identification of the sampling and analytical methods used;

(iii) A description of the type of respiratory protective devices worn, if any; and

(iv) The name, Social Security number, job classification, and exposure levels of the employee monitored and all other employees whose exposure the measurement is intended to represent.

(c) The employer shall maintain this record for at least 30 years, in accordance with Part B of this chapter.

(4) Medical surveillance.

(a) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance required by WAC 296-62-07625, 296-62-07627, and 296-62-07629, in accordance with Part B of this chapter.

(b) This record shall include:

(i) The name, Social Security number, and description of the duties of the employee;

(ii) The employer's copy of the physician's written opinion on the initial, periodic, and any special examinations, including results of medical examination and all tests, opinions, and recommendations;

(iii) Results of any airborne exposure monitoring done for that employee and the representative exposure levels supplied to the physician; and

(iv) Any employee medical complaints related to exposure to MDA.

(c) The employer shall keep, or assure that the examining physician keeps, the following medical records:

(i) A copy of this standard and its appendices, except that the employer may keep one copy of the standard and its appendices for all employees provided the employer references the standard and its appendices in the medical surveillance record of each employee;

(ii) A copy of the information provided to the physician as required by any sections in the regulatory text;

(iii) A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to the information;

(iv) A copy of the employee's medical and work history related to exposure to MDA.

(d) The employer shall maintain this record for at least the duration of employment plus 30 years, in accordance with Part B of this chapter.

(5) Medical removals.

(a) The employer shall establish and maintain an accurate record for each employee removed from current exposure to MDA pursuant to WAC 296-62-07625, 296-62-07627, and 296-62-07629.

(b) Each record shall include:

(i) The name and Social Security number of the employee;

(ii) The date of each occasion that the employee was removed from current exposure to MDA as well as the corresponding date on which the employee was returned to his or her former job status;

(iii) A brief explanation of how each removal was or is being accomplished; and

(iv) A statement with respect to each removal indicating the reason for the removal.

(c) The employer shall maintain each medical removal record for at least the duration of an employee's employment plus 30 years.

(6) Availability.

(a) The employer shall assure that records required to be maintained by WAC 296-62-076 shall be made available, upon request, to the director for examination and copying.

(b) Employee exposure monitoring records required by WAC 296-62-076 shall be provided upon request for examination and copying to employees, employee representatives, and the director in accordance with the applicable sections of WAC 296-62-054.

(c) Employee medical records required by this section shall be provided upon request for examination and copying, to the subject employee, to anyone having the specific written consent of the subject employee, and to the director in accordance with Part B of this chapter.

(7) Transfer of records.

(a) The employer shall comply with the requirements involving transfer of records set forth in WAC 296-62-05215.

(b) If the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall notify the director, at least 90 days prior to disposal, and transmit the records to the director if so requested by the director within that period.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07633, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07633 Observation of monitoring. (1) Employee observation. The employer shall provide affected employees, or their designated representatives, an opportunity to observe the measuring or monitoring of employee exposure to MDA conducted pursuant to WAC 296-62-07609.

(2) Observation procedures. When observation of the measuring or monitoring of employee exposure to MDA requires entry into areas where the use of protective clothing and equipment or respirators is required, the employer shall provide the observer with personal protective clothing and equipment or respirators required to be worn by employees working in the area, assure the use of such clothing and equipment or respirators, and require the observer to comply with all other applicable safety and health procedures.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07633, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07637 Appendices. The information contained in Appendices A, B, C, and D of WAC 296-62-076 is not intended by itself, to create any additional obligations not otherwise imposed by this standard nor detract from any existing obligation. The protocols for respiratory fit testing in Appendix E of WAC 296-62-076 are mandatory.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07637, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07654 Appendix A to WAC 296-62-076—Substance data sheet, for 4,4'-methylenedianiline.

(1) Substance identification.

(a) Substance: Methylenedianiline (MDA).

(b) Permissible exposure:

(i) Airborne: Ten parts per billion parts of air (10 ppb), time-weighted average (TWA) for an 8-hour workday and an action level of five parts per billion parts of air (5 ppb).

(ii) Dermal: Eye contact and skin contact with MDA are not permitted.

(c) Appearance and odor: White to tan solid; amine odor.

(2) Health hazard data.

(a) Ways in which MDA affects your health. MDA can affect your health if you inhale it, or if it comes in contact with your skin or eyes. MDA is also harmful if you happen to swallow it. Do not get MDA in eyes, on skin, or on clothing.

(b) Effects of overexposure.

(i) Short-term (acute) overexposure: Overexposure to MDA may produce fever, chills, loss of appetite, vomiting, jaundice. Contact may irritate skin, eyes, and mucous membranes. Sensitization may occur.

(ii) Long-term (chronic) exposure. Repeated or prolonged exposure to MDA, even at relatively low concentrations, may cause cancer. In addition, damage to the liver, kidneys, blood, and spleen may occur with long-term exposure.

(iii) Reporting signs and symptoms: You should inform your employer if you develop any signs or symptoms which you suspect are caused by exposure to MDA including yellow staining of the skin.

(3) Protective clothing and equipment.

(a) Respirators. Respirators are required for those operations in which engineering controls or work practice controls are not adequate or feasible to reduce exposure to the permissible limit. If respirators are worn, they must have the joint Mine Safety and Health Administration and National Institute for Occupational Safety and Health (NIOSH) seal of approval, and cartridges or canisters must be replaced as necessary to maintain the effectiveness of the respirator. If you experience difficulty breathing while wearing a respirator, you may request a positive pressure respirator from your employer. You must be thoroughly trained to use the assigned respirator, and the training will be provided by your employer. MDA does not have a detectable odor except at levels well above the permissible exposure limits. Do not depend on odor to warn you when a respirator canister is exhausted. If you can smell MDA while wearing a respirator, proceed immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

(b) Protective clothing. You may be required to wear coveralls, aprons, gloves, face shields, or other appropriate

protective clothing to prevent skin contact with MDA. Where protective clothing is required, your employer is required to provide clean garments to you, as necessary, to assure that the clothing protects you adequately. Replace or repair impervious clothing that has developed leaks. MDA should never be allowed to remain on the skin. Clothing and shoes which are not impervious to MDA should not be allowed to become contaminated with MDA, and if they do, the clothing and shoes should be promptly removed and decontaminated. The clothing should be laundered to remove MDA or discarded. Once MDA penetrates shoes or other leather articles, they should not be worn again.

(c) Eye protection. You must wear splashproof safety goggles in areas where liquid MDA may contact your eyes. Contact lenses should not be worn in areas where eye contact with MDA can occur. In addition, you must wear a face shield if your face could be splashed with MDA liquid.

(4) Emergency and first aid procedures.

(a) Eye and face exposure. If MDA is splashed into the eyes, wash the eyes for at least 15 minutes. See a doctor as soon as possible.

(b) Skin exposure. If MDA is spilled on your clothing or skin, remove the contaminated clothing and wash the exposed skin with large amounts of soap and water immediately. Wash contaminated clothing before you wear it again.

(c) Breathing. If you or any other person breathes in large amounts of MDA, get the exposed person to fresh air at once. Apply artificial respiration if breathing has stopped. Call for medical assistance or a doctor as soon as possible. Never enter any vessel or confined space where the MDA concentration might be high without proper safety equipment and at least one other person present who will stay outside. A life line should be used.

(d) Swallowing. If MDA has been swallowed and the patient is conscious, do not induce vomiting. Call for medical assistance or a doctor immediately.

(5) Medical requirements. If you are exposed to MDA at a concentration at or above the action level for more than 30 days per year, or exposed to liquid mixtures more than 15 days per year, your employer is required to provide a medical examination, including a medical history and laboratory tests, within 60 days of the effective date of this standard and annually thereafter. These tests shall be provided without cost to you. In addition, if you are accidentally exposed to MDA (either by ingestion, inhalation, or skin/eye contact) under conditions known or suspected to constitute toxic exposure to MDA, your employer is required to make special examinations and tests available to you.

(6) Observation of monitoring. Your employer is required to perform measurements that are representative of your exposure to MDA and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you and your representative must also be provided with, and must wear, the protective clothing and equipment.

(7) Access to records. You or your representative are entitled to see the records of measurements of your exposure

to MDA upon written request to your employer. Your medical examination records can be furnished to your physician or designated representative upon request by you to your employer.

(8) Precautions for safe use, handling, and storage.

(a) Material is combustible. Avoid strong acids and their anhydrides. Avoid strong oxidants. Consult supervisor for disposal requirements.

(b) Emergency clean-up. Wear self-contained breathing apparatus and fully clothe the body in the appropriate personal protective clothing and equipment.

[Statutory Authority: Chapter 49.17 RCW, 93-04-111 (Order 92-15), § 296-62-07654, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07656 Appendix B to WAC 296-62-076—Substance technical guidelines, MDA. (1) Identification.

(a) Substance identification. Synonyms: CAS No. 101-77-9. 4,4'-methylenedianiline; 4,4'-methylenebisaniline; methylenedianiline; dianilinomethane.

(b) Formula: $C_{13}H_{14}N_2$.

(2) Physical data.

(a) Appearance and odor: White to tan solid; amine odor.

(b) Molecular weight: 198.26.

(c) Boiling point: 398-399 degrees C. at 760 mm Hg.

(d) Melting point: 88-93 degrees C. (190-100 degrees F.).

(e) Vapor pressure: 9 mmHg at 232 degrees C.

(f) Evaporation rate (n-butyl acetate= 1): Negligible.

(g) Vapor density (Air=1): Not applicable.

(h) Volatile fraction by weight: Negligible.

(i) Specific gravity (Water=1): Slight.

(j) Heat of combustion: -8.40 kcal/g.

(k) Solubility in water: Slightly soluble in cold water, very soluble in alcohol, benzene, ether, and many organic solvents.

(3) Fire, explosion, and reactivity hazard data.

(a) Flash point: 190 degrees C. (374 degrees F.) Set-a-flash closed cup.

(b) Flash point: 226 degrees C. (439 degrees F.) Cleveland open cup.

(c) Extinguishing media: Water spray; dry chemical; carbon dioxide.

(d) Special fire fighting procedures: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

(e) Unusual fire and explosion hazards: Fire or excessive heat may cause production of hazardous decomposition products.

(4) Reactivity data.

(a) Stability: Stable.

(b) Incompatibility: Strong oxidizers.

(c) Hazardous decomposition products: As with any other organic material, combustion may produce carbon monoxide. Oxides of nitrogen may also be present.

(d) Hazardous polymerization: Will not occur.

(5) Spill and leak procedures.

(a) Sweep material onto paper and place in fiber carton.

(b) Package appropriately for safe feed to an incinerator or dissolve in compatible waste solvents prior to incineration.

(c) Dispose of in an approved incinerator equipped with afterburner and scrubber or contract with licensed chemical waste disposal service.

(d) Discharge treatment or disposal may be subject to federal, state, or local laws.

(e) Wear appropriate personal protective equipment.

(6) Special storage and handling precautions.

(a) High exposure to MDA can occur when transferring the substance from one container to another. Such operations should be well ventilated and good work practices must be established to avoid spills.

(b) Pure MDA is a solid with a low vapor pressure. Grinding or heating operations increase the potential for exposure.

(c) Store away from oxidizing materials.

(d) Employers shall advise employees of all areas and operations where exposure to MDA could occur.

(7) Housekeeping and hygiene facilities.

(a) The workplace should be kept clean, orderly, and in a sanitary condition. The employer should institute a leak and spill detection program for operations involving MDA in order to detect sources of fugitive MDA emissions.

(b) Adequate washing facilities with hot and cold water are to be provided and maintained in a sanitary condition. Suitable cleansing agents should also be provided to assure the effective removal of MDA from the skin.

(8) Common operations. Common operations in which exposure to MDA is likely to occur include the following: Manufacture of MDA; manufacture of methylene diisocyanate; curing agent for epoxy resin structures; wire coating operations; and filament winding.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07656, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07658 Appendix C to WAC 296-62-076—Medical surveillance guidelines for MDA. (1) Route of entry:

Inhalation; skin absorption; ingestion. MDA can be inhaled, absorbed through the skin, or ingested.

(2) Toxicology:

MDA is a suspect carcinogen in humans. There are several reports of liver disease in humans and animals resulting from acute exposure to MDA. A well documented case of an acute cardiomyopathy secondary to exposure to MDA is on record. Numerous human cases of hepatitis secondary to MDA are known. Upon direct contact MDA may also cause damage to the eyes. Dermatitis and skin sensitization have been observed. Almost all forms of acute environmental hepatic injury in humans involve the hepatic parenchyma and produce hepatocellular jaundice. This agent produces intrahepatic cholestasis. The clinical picture consists of cholestatic jaundice, preceded or accompanied by abdominal pain, fever, and chills. Onset in about 60 percent of all observed cases is abrupt with severe abdominal pain. In about 30 percent of observed cases, the illness presented and evolved more slowly and less dramatically, with only slight abdominal pain. In about 10 percent of the cases only jaundice was evident. The cholestatic nature of the jaundice is evident in

the prominence of itching, the histologic predominance of bile stasis, and portal inflammatory infiltration, accompanied by only slight parenchymal injury in most cases, and by the moderately elevated transaminase values. Acute, high doses, however, have been known to cause hepatocellular damage resulting in elevated SGPT, SGOT, alkaline phosphatase, and bilirubin.

Absorption through the skin is rapid. MDA is metabolized and excreted over a 48-hour period. Direct contact may be irritating to the skin, causing dermatitis. Also MDA which is deposited on the skin is not thoroughly removed through washing.

MDA may cause bladder cancer in humans. Animal data supporting this assumption is not available nor is conclusive human data. However, human data collected on workers at a helicopter manufacturing facility where MDA is used suggests a higher incidence of bladder cancer among exposed workers.

(3) Signs and symptoms:

Skin may become yellow from contact with MDA.

Repeated or prolonged contact with MDA may result in recurring dermatitis (red-itchy, cracked skin) and eye irritation. Inhalation, ingestion, or absorption through the skin at high concentrations may result in hepatitis, causing symptoms such as fever and chills, nausea and vomiting, dark urine, anorexia, rash, right upper quadrant pain, and jaundice. Corneal burns may occur when MDA is splashed in the eyes.

(4) Treatment of acute toxic effects/emergency situation:

If MDA gets into the eyes, immediately wash eyes with large amounts of water. If MDA is splashed on the skin, immediately wash contaminated skin with mild soap or detergent. Employee should be removed from exposure and given proper medical treatment. Medical tests required under the emergency section of the medical surveillance subsection (13)(d) must be conducted.

If the chemical is swallowed do not induce vomiting but remove by gastric lavage.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07658, filed 2/3/93, effective 3/15/93.]

WAC 296-62-07660 Appendix D to WAC 296-62-076—Sampling and analytical methods for MDA monitoring and measurement procedures. Measurements taken for the purpose of determining employee exposure to MDA

are best taken so that the representative average 8-hour exposure may be determined from a single 8-hour sample or two 4-hour samples. Short-time interval samples (or grab samples) may also be used to determine average exposure level if a minimum of five measurements are taken in a random manner over the 8-hour work shift. Random sampling means that any portion of the work shift has the same chance of being sampled as any other. The arithmetic average of all such random samples taken on one work shift is an estimate of an employee's average level of exposure for that work shift. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

There are a number of methods available for monitoring employee exposures to MDA. The method WISHA currently uses is included below.

The employer, however, has the obligation of selecting any monitoring method which meets the accuracy and precision requirements of the standard under his/her unique field conditions. The standard requires that the method of monitoring must have an accuracy, to a 95 percent confidence level, of not less than plus or minus 25 percent for the select PEL. WISHA methodology.

Sampling procedure.

Apparatus:

Samples are collected by use of a personal sampling pump that can be calibrated within ± 5 percent of the recommended flow rate with the sampling filter in line.

Samples are collected on 37 mm Gelman type A/E glass fiber filters treated with sulfuric acid. The filters are prepared by soaking each filter with 0.5 mL of 0.26N H₂SO₄. (0.26 N H₂SO₄ can be prepared by diluting 1.5 mL of 36N H₂SO₄ to 200 mL with deionized water.) The filters are dried in an oven at 100 degrees C. for one hour and then assembled into three-piece 37 mm polystyrene cassettes without backup pads. The front filter is separated from the back filter by a polystyrene spacer. The cassettes are sealed with shrink bands and the ends are plugged with plastic plugs.

After sampling, the filters are carefully removed from the cassettes and individually transferred to small vials containing approximately 2 mL deionized water. The vials must be tightly sealed. The water can be added before or after the filters are transferred. The vials must be sealable and capable of holding at least 7 mL of liquid. Small glass scintillation vials with caps containing Teflon liners are recommended.

Reagents:

Deionized water is needed for addition to the vials.

Sampling technique:

Immediately before sampling, remove the plastic plugs from the filter cassettes.

Attach the cassette to the sampling pump with flexible tubing and place the cassette in the employee's breathing zone.

After sampling, seal the cassettes with plastic plugs until the filters are transferred to the vials containing deionized water.

At some convenient time within 10 hours of sampling, transfer the sample filters to vials.

Seal the small vials lengthwise.

Submit at least one blank filter with each sample set. Blanks should be handled in the same manner as samples, but no air is drawn through them.

Record sample volumes (in L of air) for each sample, along with any potential interferences.

Retention efficiency:

A retention efficiency study was performed by drawing 100 L of air (80 percent relative humidity) at 1 L/min through

sample filters that had been spiked with 0.814 microgram MDA. Instead of using backup pads, blank acid-treated filters were used as backups in each cassette. Upon analysis, the top filters were found to have an average of 91.8 percent of the spiked amount. There was no MDA found on the bottom filters, so the amount lost was probably due to the slight instability of the MDA salt.

Extraction efficiency:

The average extraction efficiency for six filters spiked at the target concentration is 99.6 percent.

The stability of extracted and derivatized samples was verified by reanalyzing the above six samples the next day using fresh standards. The average extraction efficiency for the reanalyzed samples is 98.7 percent.

Recommended air volume and sampling rate:

The recommended air volume is 100 L.

The recommended sampling rate is 1 L/min.

Interferences (sampling):

MDI appears to be a positive interference. It was found that when MDI was spiked onto an acid-treated filter, the MDI converted to MDA after air was drawn through it.

Suspected interferences should be reported to the laboratory with submitted samples.

Safety precautions (sampling):

Attach the sampling equipment to the employees so that it will not interfere with work performance or safety.

Follow all safety procedures that apply to the work area being sampled.

Analytical procedure:

Apparatus: The following are required for analysis.

A GC equipped with an electron capture detector. For this evaluation a Hewlett Packard 5880 Gas Chromatograph equipped with a Nickel 63 High Temperature Electron Capture Detector and a Linearizer was used.

A GC column capable of separating the MDA derivative from the solvent and interferences. A 6 ft X 2 mm ID glass column packed with 3 percent OV-101 coated on 100/120 Gas Chrom Q or a 25 meter DB-1 or DB-5 capillary column is recommended for this evaluation.

A electronic integrator or some other suitable means of measuring peak areas or heights.

Small resealable vials with Teflon-lined caps capable of holding 4 mL.

A dispenser or pipet for toluene capable of delivering 2.0 mL.

Pipets (or repipets with plastic or Teflon tips) capable of delivering 1 mL for the sodium hydroxide and buffer solutions.

A repipet capable of delivering 25 micro-L HFAA.

Syringes for preparation of standards and injection of standards and samples into a GC.

Volumetric flasks and pipets to dilute the pure MDA in preparation of standards.

Disposable pipets to transfer the toluene layers after the samples are extracted.

Reagents:

0.5 NaOH prepared from reagent grade NaOH.

Toluene, pesticide grade. Burdick and Jackson distilled in glass toluene was used.

Heptafluorobutyric acid anhydride (HFAA). HFAA from Pierce Chemical Company was used.

pH 7.0 phosphate buffer, prepared from 136 g potassium dihydrogen phosphate and 1 L deionized water. The pH is adjusted to 7.0 with saturated sodium hydroxide solution.

4,4'-Methylenedianiline (MDA), reagent grade.

Standard preparation:

Concentrated stock standards are prepared by diluting pure MDA with toluene. Analytical standards are prepared by injecting uL amounts of diluted stock standards into vials that contain 2.0 mL toluene.

25 µL HFAA are added to each vial and the vials are capped and shaken for 10 seconds.

After 10 min, 1 mL of buffer is added to each vial.

The vials are recapped and shaken for 10 seconds.

After allowing the layers to separate, aliquots of the toluene (upper) layers are removed with a syringe and analyzed by GC.

Analytical standard concentrations should bracket sample concentrations. Thus, if samples fall out of the range of prepared standards, additional standards must be prepared to ascertain detector response.

Sample preparation:

The sample filters are received in vials containing deionized water.

1 mL of 0.5N NaOH and 2.0 mL toluene are added to each vial.

The vials are recapped and shaken for 10 min.

After allowing the layers to separate, approximately 1 mL aliquots of the toluene (upper) layers are transferred to separate vials with clean disposable pipets.

The toluene layers are treated and analyzed.

Analysis:

GC conditions

Zone temperatures:

Column—220 degrees C.

Injector—235 degrees C.

Detector—335 degrees C.

C Gas flows, N₂ Column—30 mL/min

He Column 0.9 mL/min. (capillary) with
30 mL/min. A₅CH₄ (95/5) makeup gas

Injection volume: 5.0 uL

Column: 6 ft X 1/8 in ID glass, 3% OV-101 on 100/120 Gas Chrom Q or 25 meter x .25 mm DB-1 or DB-8 capillary

Retention time of MDA derivative: 2.5 to 3.5, depending on column and flow

Chromatogram:

Peak areas or heights are measured by an integrator or other suitable means.

A calibration curve is constructed by plotting response (peak areas or heights) of standard injections versus ug of MDA per sample. Sample concentrations must be bracketed by standards.

Interferences (analytical):

Any compound that gives an electron capture detector response and has the same general retention time as the HFAA derivative of MDA is a potential interference. Suspected interferences reported to the laboratory with submitted samples by the industrial hygienist must be considered before samples are derivatized.

GC parameters may be changed to possibly circumvent interferences.

Retention time on a single column is not considered proof of chemical identity. Analyte identity should be confirmed by GC/MS if possible.

Calculations:

The analyte concentration for samples is obtained from the calibration curve in terms of ug MDA per sample. The extraction efficiency is 100 percent. If any MDA is found on the blank, that amount is subtracted from the sample amounts. The air concentrations are calculated using the following formulae: $\text{Microgram/m}^3 = (\text{microgram MDA per sample}) / (\text{L of air sampled})$ $\text{ppb} = (\text{microgram/m}^3) (24.46) / (198.3) = (\text{microgram/m}^3) (0.1233)$ where 24.46 is the molar volume at 25 degrees C. and 760 mm Hg.

Safety precautions (analytical):

Avoid skin contact and inhalation of all chemicals.

Restrict the use of all chemicals to a fume hood if possible.

Wear safety glasses and a lab coat at all times while in the lab area.

[Statutory Authority: Chapter 49.17 RCW. 93-04-111 (Order 92-15), § 296-62-07660, filed 2/3/93, effective 3/15/93.]

PART I-1--ASBESTOS, TREMOLITE, ANTHOPHYLLITE, AND ACTINOLITE

WAC 296-62-077 Asbestos, tremolite, anthophyllite, and actinolite.

[Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-077, filed 4/27/87.]

WAC 296-62-07701 Scope and application. (1) WAC 296-62-07701 through 296-62-07753 applies to all occupational exposures to asbestos in all industries covered by chapter 49.17 RCW, Washington Industrial Safety and Health Act and chapter 49.26 RCW, Health and safety—Asbestos.

(2) This part applies to construction work as defined in WAC 296-155-012 except for work involving asbestos-containing asphalt roof coatings, cements, and mastics. The exception for roofing materials does not apply to asphalt coated asbestos felting and similar built-up roofing.

(3) This part applies to ship repairing, shipbuilding and shipbreaking employments and related employments as defined in WAC 296-304-01001 except for work involving asbestos-containing asphalt roof coatings, cements, and mastics. The exception for roofing materials does not apply to asphalt coated asbestos felting and similar built-up roofing.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07701, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07701, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07701, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07701, filed 4/27/87.]

WAC 296-62-07703 Definitions. For the purpose of WAC 296-62-07701 through 296-62-07753:

Accredited inspector means any person meeting the accreditation requirements of the Federal Toxic Substance Control Act, Section 206(a)(1) and (3). 15 U.S.C. 2646(a)(1) and (3).

Aggressive method means removal or disturbance of building material by sanding, abrading, grinding or other method that breaks, crumbles, or disintegrates intact ACM.

Amended water means water to which surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate ACM.

Asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.

For purposes of this standard, "asbestos" includes PACM, as defined below.

Asbestos abatement project means an asbestos project involving three square feet or three linear feet, or more, of asbestos-containing material.

Asbestos-containing material (ACM) means any material containing more than 1% asbestos.

Asbestos project includes the construction, demolition, repair, remodeling, maintenance or renovation of any public or private building or structure, mechanical piping equipment or system involving the demolition, removal, encapsulation, salvage, or disposal of material or outdoor activity releasing or likely to release asbestos fibers into the air.

Authorized person means any person authorized by the employer and required by work duties to be present in regulated areas.

Building/facility/vessel owner means any legal entity or person who owns any public or private building, vessel, structure, facility, or mechanical system or the remnants thereof, including the agent of such person, but does not include individuals who work on asbestos projects in their own single-family residences, no part of which is used for commercial purposes. Also included is any lessee, who exercises control over management and record keeping functions

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relating to a building, vessel, and/or facility in which activities covered by this standard takes place.

Certified asbestos supervisor means an individual certified by the department under WAC 296-65-012.

Certified asbestos worker means an individual certified by the department under WAC 296-65-010.

Certified industrial hygienist (CIH) means one certified in the practice of industrial hygiene by the American Board of Industrial Hygiene.

Class I asbestos work means activities involving the removal of thermal system insulation or surfacing ACM/PACM.

Class II asbestos work means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.

Class III asbestos work means repair and maintenance operations where "ACM," including TSI and surfacing ACM and PACM, may be disturbed.

Class IV asbestos work means maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities to clean up dust, waste and debris resulting from Class I, II, and III activities.

Clean room means an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

Closely resemble means that the major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.

Competent person means, in addition to the definition in WAC 296-62-07728, one who is capable of identifying existing asbestos, hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them as specified in WAC 296-62-07728. The competent person shall be certified as an asbestos supervisor in compliance with WAC 296-65-030(3) and 296-65-012 for Class I and Class II work, and for Class III and Class IV work involving 3 square feet or 3 linear feet or more of asbestos-containing material. For Class III and Class IV work, involving less than 3 square feet or 3 linear feet, the competent person shall be trained in an operations and maintenance (O&M) course which meets the criteria of EPA (40 CFR 763.92 (a)(2)).

Critical barrier means one or more layers of plastic sealed over all openings into a work area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a work area from migrating to an adjacent area.

Decontamination area means an enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment contaminated with asbestos.

Demolition means the wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products. Where feasible,

[Title 296 WAC—p. 1665]

asbestos-containing materials shall be removed from all structures prior to the commencement of any demolition activity as per WAC 296-155-775(9).

Department means the department of labor and industries.

Director means the director of the department of labor and industries or his/her authorized representative.

Director of NIOSH means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

Disturb or disturbance refers to activities that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. This term includes activities that disrupt the matrix of ACM or PACM, render ACM or PACM friable, or generate visible debris. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard size glove bag or waste bag in order to access a building or vessel component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or waste bag which shall not exceed 60 inches in length and width.

Employee exposure means that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

Equipment room (change room) means a contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Fiber means a particulate form of asbestos, five micrometers or longer, with a length-to-diameter ratio of at least three to one.

Glove bag means not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.

High-efficiency particulate air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 micrometers mean aerodynamic diameter or larger.

Homogeneous area means an area of surfacing material or thermal system insulation that is uniform in color and texture.

Industrial hygienist means a professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards.

Intact means that the ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix. Friable ACM that is disturbed, as defined in this part, is presumed to be no longer intact.

Modification for the purpose of WAC 296-62-07712 means a changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system. Omitting a procedure or component, or reducing or diminishing the stringency or strength of a material or component of the control system is not a "modification" for the purposes of WAC 296-62-07712.

Negative initial exposure assessment means a demonstration by the employer (which complies with the criteria in WAC 296-62-07709) that employee exposure during an operation is expected to be consistently below the PELs.

PACM means "presumed asbestos-containing material."

Presumed asbestos-containing material means thermal system insulation and surfacing material found in buildings, vessels, and vessel sections constructed no later than 1980. The designation of a material as "PACM" may be rebutted pursuant to WAC 296-62-07721.

Project designer means a person who has successfully completed the training requirements for an abatement project designer established by 40 U.S.C. 763.90(g).

Regulated area means an area established by the employer to demarcate areas where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulate; and a work area within which airborne concentrations of asbestos, exceed or can reasonably be expected to exceed the permissible exposure limit. Requirements for regulated areas are set out in WAC 296-62-07711.

Removal means all operations where ACM and/or PACM is taken out or stripped from structures or substrates, and includes demolition operations.

Renovation means the modifying of any existing vessel, vessel section, structure, or portion thereof.

Repair means overhauling, rebuilding, reconstructing, or reconditioning of vessels, vessel sections, structures or substrates, including encapsulation or other repair of ACM or PACM attached to vessels, vessel sections, structures or substrates.

Surfacing material means material that is sprayed, troweled-on or otherwise applied to surfaces (such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, and other purposes).

Surfacing ACM means surfacing material which contains more than 1% asbestos.

Thermal system insulation (TSI) means ACM applied to pipes, fittings, boilers, breaching, tanks, ducts, or other structural components to prevent heat loss or gain.

Thermal system insulation ACM is thermal system insulation which contains more than 1% asbestos.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07703, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07703, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-62-07703, filed 10/10/89, effective 11/24/89; 89-11-035 (Order 89-03), § 296-62-07703, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07703, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07703, filed 4/27/87.]

WAC 296-62-07705 Permissible exposure limits (PEL). (1) Time weighted average (TWA). The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fiber per cubic centimeter (0.1 f/cc) of air as an eight-hour time-weighted average (TWA) as determined by the method prescribed in Appendix

A of this part, or by an equivalent method recognized by the department.

(2) Excursion limit. The employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 1.0 fiber per cubic centimeter of air (1 f/cc) as averaged over a sampling period of thirty minutes, as determined by the method prescribed in Appendix A of this part, or by an equivalent method recognized by the department.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07705, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-07705, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07705, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07705, filed 4/27/87.]

WAC 296-62-07706 Multi-employer worksites. (1) On multi-employer worksites, an employer performing work requiring the establishment of a regulated area shall inform other employers on the site of the nature of the employer's work with asbestos and/or PACM, of the existence of and requirements pertaining to regulated areas, and the measures taken to ensure that employees of such other employers are not exposed to asbestos.

(2) Asbestos hazards at a multi-employer worksite shall be abated by the employer who created or controls the source of asbestos contamination. For example, if there is a significant breach of an enclosure containing Class I work, the employer responsible for erecting the enclosure shall repair the breach immediately.

(3) In addition, all employers of employees exposed to asbestos hazards shall comply with applicable protective provisions to protect their employees. For example, if employees working immediately adjacent to a Class I asbestos job are exposed to asbestos due to the inadequate containment of such jobs, their employer shall either remove the employees from the area until the enclosure breach is repaired; or perform an initial exposure assessment pursuant to WAC 296-62-07709.

(4) All employers of employees working adjacent to regulated areas established by another employer on a multi-employer worksite, shall take steps on a daily basis to ascertain the integrity of the enclosure and/or the effectiveness of the control method relied on by the primary asbestos contractor to assure that asbestos fibers do not migrate to such adjacent areas.

(5) All general contractors on a construction project which includes work covered by this standard shall be deemed to exercise general supervisory authority over the work covered by this standard, even though the general contractor is not qualified to serve as the asbestos "competent person" as defined by WAC 296-62-07703. As supervisor of the entire project, the general contractor shall ascertain whether the asbestos contractor is in compliance with this standard, and shall require such contractor to come into compliance with this standard when necessary.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07706, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-07706, filed 8/3/94, effective 9/12/94; 87-24-051 (Order 87-24), § 296-62-07706, filed 11/30/87.]

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WAC 296-62-07709 Exposure assessment and monitoring. (1) General monitoring criteria.

(a) Each employer who has a workplace or work operation where exposure monitoring is required under this part must perform monitoring to determine accurately the airborne concentrations of asbestos to which employees may be exposed.

(b) Determinations of employee exposure must be made from breathing zone air samples that are representative of the eight-hour TWA and thirty minute short-term exposures of each employee.

(c) Representative eight-hour TWA employee exposures must be determined on the basis of one or more samples representing full-shift exposure for each shift for each employee in each job classification in each work area.

(d) Representative thirty minute short-term employee exposures must be determined on the basis of one or more samples representing thirty minute exposures associated with operations that are most likely to produce exposures above the excursion limit for each shift for each job classification in each work area.

(2) Exposure monitoring requirements for all occupational exposures to asbestos in all industries covered by the Washington Industrial Safety and Health Act except construction work, as defined in WAC 296-155-012, and except ship repairing, shipbuilding and shipbreaking employments and related employments as defined in WAC 296-304-01001.

(a) Initial monitoring.

(i) Each employer who has a workplace or work operation covered by this standard, except as provided for in (a)(ii) and (iii) of this subsection, must perform initial monitoring of employees who are, or may reasonably be expected to be exposed to airborne concentrations at or above the TWA permissible exposure limit and/or excursion limit. The initial monitoring must be at the initiation of each asbestos job to accurately determine the airborne concentration of asbestos to which employees may be exposed.

(ii) Where the employer or his/her representative has monitored after March 31, 1992, for the TWA permissible exposure limit and/or excursion limit, and the monitoring satisfies all other requirements of this section, and the monitoring data was obtained during work operations conducted under workplace conditions closely resembling the processes, type of material including percentage of asbestos, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of (a)(i) of this subsection.

(iii) Where the employer has relied upon objective data that demonstrates that asbestos is not capable of being released in airborne concentrations at or above the TWA permissible exposure limit and/or excursion limit under those work conditions of processing, use, or handling expected to have the greatest potential for releasing asbestos, then no initial monitoring is required.

(b) Monitoring frequency (periodic monitoring) and patterns. After the initial determinations required by subsection (2)(a)(i) of this section, samples must be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. Sampling must not be at

intervals greater than six months for employees whose exposures may reasonably be foreseen to exceed the TWA permissible exposure limit and/or excursion limit.

(c) Daily monitoring within regulated areas: The employer must conduct daily monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area. Exception: When all employees within a regulated area are equipped with full facepiece supplied-air respirators operated in the pressure-demand mode equipped with either an auxiliary positive pressure self-contained breathing apparatus or a HEPA filter, the employer may dispense with the daily monitoring required by this subsection.

(d) Changes in monitoring frequency. If either the initial or the periodic monitoring required by subsection (2)(a) and (b) of this section statistically indicates that employee exposures are below the TWA permissible exposure limit and/or excursion limit, the employer may discontinue the monitoring for those employees whose exposures are represented by such monitoring.

(e) Additional monitoring. Notwithstanding the provisions of subsection (2)(a)(ii) and (c) of this section, the employer must institute the exposure monitoring required under subsection (2)(a)(i) and (ii) of this section whenever there has been a change in the production, process, control equipment, personnel, or work practices that may result in new or additional exposures above the TWA permissible exposure limit and/or excursion limit, or when the employer has any reason to suspect that a change may result in new or additional exposures above the TWA permissible exposure limit and/or excursion limit.

(3) Exposure assessment monitoring requirements for all construction work as defined in WAC 296-155-012 and for all ship repairing, shipbuilding and shipbreaking employments and related employments as defined in WAC 296-304-01001.

(a) Initial exposure assessment.

(i) Each employer who has a workplace or work operation covered by this standard must ensure that a "competent person" conducts an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposures during that operation or workplace. The assessment must be completed in time to comply with the requirements which are triggered by exposure data or lack of a "negative exposure assessment," and to provide information necessary to assure that all control systems planned are appropriate for that operation and will work properly.

(ii) Basis of initial exposure assessment: Unless a negative exposure assessment has been made according to (b) of this subsection, the initial exposure assessment must, if feasible, be based on monitoring conducted according to (b) of this subsection. The assessment must take into consideration both the monitoring results and all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace, or of the operations of the employer which indicate the levels of airborne asbestos likely to be encountered on the job. For Class I asbestos work, until the employer conducts exposure monitoring and documents that employees on that job will not be exposed in excess of the PELs, or other-

wise makes a negative exposure assessment according to (b) of this subsection, the employer must presume that employees are exposed in excess of the TWA and excursion limit.

(b) Negative exposure assessment: For any one specific asbestos job which will be performed by employees who have been trained in compliance with the standard, the employer may demonstrate that employee exposures will be below the PELs by data which conform to the following criteria:

(i) Objective data demonstrating that the products or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the TWA and excursion limit under those work conditions having the greatest potential for releasing asbestos; or

(ii) Where the employer has monitored prior asbestos jobs for the PEL and the excursion limit within 12 months of the current or projected job, the monitoring and analysis were performed in compliance with the asbestos standard in effect; and the data was obtained during work operations conducted under workplace conditions "closely resembling" the processes, type of material including percentage of asbestos, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job, and these data show that under the conditions prevailing and which will prevail in the current workplace there is a high degree of certainty that employee exposures will not exceed the TWA or excursion limit; or

(iii) The results of initial exposure monitoring of the current job made from breathing zone samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee covering operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

(c) Periodic monitoring.

(i) Class I and Class II operations. The employer must conduct daily monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area who is performing Class I or II work, unless the employer according to (b) of this subsection, has made a negative exposure assessment for the entire operation.

(ii) All operations under the standard other than Class I and II operations. The employer must conduct periodic monitoring of all work where exposures are expected to exceed a PEL, at intervals sufficient to document the validity of the exposure prediction.

(iii) Exception. When all employees required to be monitored daily are equipped with supplied-air respirators operated in the pressure demand mode, the employer may dispense with the daily monitoring required by subsection (2)(c) of this section. However, employees performing Class I work using a control method which is not listed in WAC 296-62-07712 or using a modification of a listed control method, must continue to be monitored daily even if they are equipped with supplied-air respirators.

(d) Termination of monitoring. If the periodic monitoring required by (c) of this subsection reveals that employee

exposures, as indicated by statistically reliable measurements, are below the permissible exposure limit and excursion limit the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

(e) Monitoring outside negative-pressure enclosures: The employer must conduct representative area monitoring of the airborne fiber levels at least every other day at the HEPA machine exhaust and entrance to the decontamination area.

(f) Additional monitoring. Notwithstanding the provisions of (b), (c), and (d) of this subsection, the employer must institute the exposure monitoring required under (c) of this subsection whenever there has been a change in process, control equipment, personnel or work practices that may result in new or additional exposures above the permissible exposure limit and/or excursion limit or when the employer has any reason to suspect that a change may result in new or additional exposures above the permissible exposure limit and/or excursion limit. Such additional monitoring is required regardless of whether a "negative exposure assessment" was previously produced for a specific job.

(g) Preabatement monitoring. Prior to the start of asbestos work, representative area air monitoring must be conducted for comparison to clearance monitoring as required by subsection (3)(h) of this section. Preabatement air monitoring is not required for outdoor work.

(h) Clearance monitoring. Representative area air monitoring must be taken at the completion of the asbestos work. Air sample results must be obtained before removal or reoccupancy of the regulated area. Clearance air monitoring is not required for outdoor asbestos work. The employer must demonstrate by monitoring that the airborne concentration is below:

- The permissible exposure limit; or
- At or below the airborne fiber level existing prior to the start of the asbestos work, whichever level is lower.

(4) Method of monitoring.

(a) All samples taken to satisfy the employee exposure monitoring requirements of this section must be personal samples collected following the procedures specified in WAC 296-62-07735, Appendix A.

(b) Monitoring must be performed by persons having a thorough understanding of monitoring principles and procedures and who can demonstrate proficiency in sampling techniques.

(c) All samples taken to satisfy the monitoring requirements of this section must be evaluated using the WISHA reference method specified in WAC 296-62-07735, Appendix A, or an equivalent counting method recognized by the department.

(d) If an equivalent method to the WISHA reference method is used, the employer must ensure that the method meets the following criteria:

(i) Replicate exposure data used to establish equivalency are collected in side-by-side field and laboratory comparisons; and

(ii) The comparison indicates that ninety percent of the samples collected in the range 0.5 to 2.0 times the permissible limit have an accuracy range of plus or minus twenty-five

percent of the WISHA reference method results at a ninety-five percent confidence level as demonstrated by a statistically valid protocol; and

(iii) The equivalent method is documented and the results of the comparison testing are maintained.

(e) To satisfy the monitoring requirements of this section, employers must use the results of monitoring analysis performed by laboratories which have instituted quality assurance programs that include the elements as prescribed in WAC 296-62-07735, Appendix A.

(5) Employee notification of monitoring results.

(a) The employer must, as soon as possible but no later than within fifteen working days after the receipt of the results of any monitoring performed under the standard, notify the affected employees of these results in writing either individually or by posting of results in an appropriate location that is accessible to affected employees.

(b) The written notification required by (a) of this subsection must contain the corrective action being taken by the employer to reduce employee exposure to or below the TWA and/or excursion exposure limits, wherever monitoring results indicated that the TWA and/or excursion exposure limits had been exceeded.

(6) Observation of monitoring.

(a) The employer must provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to asbestos conducted in accordance with this section.

(b) When observation of the monitoring of employee exposure to asbestos requires entry into an area where the use of protective clothing or equipment is required, the observer must be provided with and be required to use such clothing and equipment and shall comply with all other applicable safety and health procedures.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050, and 49.26.130. 00-06-075, § 296-62-07709, filed 3/1/00, effective 4/10/00. Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07709, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-01-079, § 296-62-07709, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-07709, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07709, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07709, filed 4/27/87.]

WAC 296-62-07711 Regulated areas. (1) General. The employer shall establish a regulated area in work areas where airborne concentrations of asbestos exceed or can reasonably be expected to exceed the permissible exposure limits prescribed in WAC 296-62-07705. All Class I, II and III asbestos work shall be conducted within regulated areas. All other operations covered by this standard shall be conducted within the regulated area where airborne concentrations of asbestos exceed or can reasonably be expected to exceed permissible exposure limits. Regulated areas shall comply with the requirements of subsections (2), (3), (4), (5), (6), (7), and (8) of this section.

(2) Demarcation. The regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pres-

sure enclosures are used, they may demarcate the regulated area. Signs shall be provided and displayed pursuant to the requirements of WAC 296-62-07721.

(3) Access. Access to regulated areas shall be limited to authorized persons or to persons authorized by the Washington Industrial Safety and Health Act or regulations issued pursuant thereto.

(4) Provision of respirators. Each person entering a regulated area where employees are required in WAC 296-62-07715(1) to wear respirators shall be supplied with and required to use a respirator, selected in accordance with WAC 296-62-07715(2).

(5) Protective clothing. All persons entering a regulated area shall be supplied with and required to wear protective clothing, selected in accordance with WAC 296-62-07717.

(6) Prohibited activities. The employer shall ensure that employees do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the regulated areas.

(7) Permit-required confined space. The employer shall determine if a permit-required confined space hazard exists and shall take any necessary precautions in accordance with chapter 296-62 WAC Part M.

(8) Competent persons. For construction and shipyard work the employer shall ensure that all asbestos work performed within regulated areas is supervised by a competent person, as defined in WAC 296-62-07703. The duties of the competent person are set out in WAC 296-62-07728.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07711, filed 9/5/97, effective 11/5/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07711, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-07711, filed 1/18/95, effective 3/1/95; 93-19-142 (Order 93-04), § 296-62-07711, filed 9/22/93, effective 11/1/93; 89-11-035 (Order 89-03), § 296-62-07711, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07711, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07711, filed 4/27/87.]

WAC 296-62-07712 Requirements for asbestos activities in construction and shipyard work. (1) Methods of compliance, the following engineering controls and work practices of this section must be used for construction work defined in WAC 296-155-012 and for all ship repair defined in WAC 296-304-010.

(2) Engineering controls and work practices for all operations covered by this section. The employer must use the following engineering controls and work practices in all operations covered by this section, regardless of the levels of exposure:

(a) Vacuum cleaners equipped with HEPA filters to collect all debris and dust containing ACM and PACM, except as provided in subsection (10)(b) of this section in the case of roofing material.

(b) Wet methods, or wetting agents, to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup, except where employers demonstrate that the use of wet methods is infeasible due to, for example, the creation of electrical hazards, equipment malfunction, and, in roofing, except as provided in subsection (10)(b) of this section.

(c) Asbestos must be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet saturated state to prevent the emission of airborne fibers unless the usefulness of the product would be diminished thereby.

(d) Prompt cleanup and disposal of wastes and debris contaminated with asbestos in leak-tight containers except in roofing operations, where the procedures specified in this section apply.

(3) In addition to the requirements of subsection (2) of this section, the employer must use the following control methods to achieve compliance with the TWA permissible exposure limit and excursion limit prescribed by WAC 296-62-07705:

(a) Local exhaust ventilation equipped with HEPA filter dust collection systems;

(b) Enclosure or isolation of processes producing asbestos dust;

(c) Ventilation of the regulated area to move contaminated air away from the breathing zone of employees and toward a filtration or collection device equipped with a HEPA filter;

(d) Use of other work practices and engineering controls that the department can show to be feasible;

(e) Wherever the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the permissible exposure limit and/or excursion limit prescribed in WAC 296-62-07705, the employer must use them to reduce employee exposure to the lowest levels attainable by these controls and must supplement them by the use of respiratory protection that complies with the requirements of WAC 296-62-07715.

(4) Prohibitions. The following work practices and engineering controls must not be used for work related to asbestos or for work which disturbs ACM or PACM, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:

(a) High-speed abrasive disc saws that are not equipped with point or cut ventilator or enclosures with HEPA filtered exhaust air;

(b) Compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air;

(c) Dry sweeping, shoveling or other dry cleanup of dust and debris containing ACM and PACM;

(d) Employee rotation as a means of reducing employee exposure to asbestos.

(5) Cleanup.

(a) After completion of asbestos work (removal, demolition, and renovation operations), all surfaces in and around the work area must be cleared of any asbestos debris.

(b) Encapsulant must be applied to all areas where asbestos has been removed to ensure binding of any remaining fibers.

(6) Class I requirements. The following engineering controls and work practices and procedures must be used:

(a) All Class I work, including the installation and operation of the control system must be supervised by a competent person as defined in WAC 296-62-07703;

(b) For all Class I jobs involving the removal of more than 25 linear or 10 square feet of thermal system insulation or surfacing material; for all other Class I jobs, where the employer cannot produce a negative exposure assessment according to WAC 296-62-07709(3), or where employees are working in areas adjacent to the regulated area, while the Class I work is being performed, the employer must use one of the following methods to ensure that airborne asbestos does not migrate from the regulated area:

(i) Critical barriers must be placed over all the openings to the regulated area, except where activities are performed outdoors; or

(ii) The employer must use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area surveillance during each work shift at each boundary of the regulated area, showing no visible asbestos dust; and perimeter area monitoring showing that clearance levels contained in 40 CFR Part 763, Subpart E, of the EPA Asbestos in Schools Rule are met, or that perimeter area levels, measured by Phase Contrast Microscopy (PCM) are no more than background levels representing the same area before the asbestos work began. The results of such monitoring must be made known to the employer no later than 24 hours from the end of the work shift represented by such monitoring. Exception: For work completed outdoors where employees are not working in areas adjacent to the regulated areas, (a) of this subsection is satisfied when the specific control methods in subsection (7) of this section are used;

(c) For all Class I jobs, HVAC systems must be isolated in the regulated area by sealing with a double layer of 6 mil plastic or the equivalent;

(d) For all Class I jobs, impermeable dropcloths shall be placed on surfaces beneath all removal activity;

(e) For all Class I jobs, all objects within the regulated area must be covered with impermeable dropcloths or plastic sheeting which is secured by duct tape or an equivalent;

(f) For all Class I jobs where the employer cannot produce a negative exposure assessment, or where exposure monitoring shows that a PEL is exceeded, the employer must ventilate the regulated area to move contaminated air away from the breathing zone of employees toward a HEPA filtration or collection device.

(7) Specific control methods for Class I work. In addition, Class I asbestos work must be performed using one or more of the following control methods according to the limitations stated below:

(a) Negative pressure enclosure (NPE) systems: NPE systems may be used where the configuration of the work area does not make the erection of the enclosure infeasible, with the following specifications and work practices:

(i) Specifications:

(A) The negative pressure enclosure (NPE) may be of any configuration;

(B) At least 4 air changes per hour must be maintained in the NPE;

(C) A minimum of -0.02 column inches of water pressure differential, relative to outside pressure, must be maintained within the NPE as evidenced by manometric measurements;

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(D) The NPE must be kept under negative pressure throughout the period of its use; and

(E) Air movement must be directed away from employees performing asbestos work within the enclosure, and toward a HEPA filtration or collection device.

(ii) Work practices:

(A) Before beginning work within the enclosure and at the beginning of each shift, the NPE must be inspected for breaches and smoke-tested for leaks, and any leaks sealed.

(B) Electrical circuits in the enclosure must be deactivated, unless equipped with ground-fault circuit interrupters.

(b) Glove bag systems may be used to remove PACM and/or ACM from straight runs of piping and elbows and other connections with the following specifications and work practices:

(i) Specifications:

(A) Glove bags must be made of 6 mil thick plastic and must be seamless at the bottom.

(B) Glove bags used on elbows and other connections must be designed for that purpose and used without modifications.

(ii) Work practices:

(A) Each glove bag must be installed so that it completely covers the circumference of pipe or other structure where the work is to be done.

(B) Glove bags must be smoke-tested for leaks and any leaks sealed prior to use.

(C) Glove bags may be used only once and may not be moved.

(D) Glove bags must not be used on surfaces whose temperature exceeds 150°F.

(E) Prior to disposal, glove bags must be collapsed by removing air within them using a HEPA vacuum.

(F) Before beginning the operation, loose and friable material adjacent to the glove bag/box operation must be wrapped and sealed in two layers of six mil plastic or otherwise rendered intact.

(G) Where system uses attached waste bag, such bag must be connected to collection bag using hose or other material which must withstand pressure of ACM waste and water without losing its integrity.

(H) Sliding valve or other device must separate waste bag from hose to ensure no exposure when waste bag is disconnected.

(I) At least two persons must perform Class I glove bag removal operations.

(c) Negative pressure glove bag systems. Negative pressure glove bag systems may be used to remove ACM or PACM from piping.

(i) Specifications: In addition to specifications for glove bag systems above, negative pressure glove bag systems must attach HEPA vacuum systems or other devices to bag during removal.

(ii) Work practices:

(A) The employer must comply with the work practices for glove bag systems in this section.

(B) The HEPA vacuum cleaner or other device used during removal must run continually during the operation until it is completed at which time the bag must be collapsed prior to removal of the bag from the pipe.

(C) Where a separate waste bag is used along with a collection bag and discarded after one use, the collection bag may be reused if rinsed clean with amended water before reuse.

(d) Negative pressure glove box systems: Negative pressure glove boxes may be used to remove ACM or PACM from pipe runs with the following specifications and work practices:

(i) Specifications:

(A) Glove boxes must be constructed with rigid sides and made from metal or other material which can withstand the weight of the ACM and PACM and water used during removal.

(B) A negative pressure generator must be used to create negative pressure in the system.

(C) An air filtration unit must be attached to the box.

(D) The box must be fitted with gloved apertures.

(E) An aperture at the base of the box must serve as a bagging outlet for waste ACM and water.

(F) A back-up generator must be present on site.

(G) Waste bags must consist of 6 mil thick plastic double-bagged before they are filled or plastic thicker than 6 mil.

(ii) Work practices:

(A) At least two persons must perform the removal.

(B) The box must be smoke-tested for leaks and any leaks sealed prior to each use.

(C) Loose or damaged ACM adjacent to the box must be wrapped and sealed in two layers of 6 mil plastic prior to the job, or otherwise made intact prior to the job.

(D) A HEPA filtration system must be used to maintain pressure barrier in box.

(e) Water spray process system. A water spray process system may be used for removal of ACM and PACM from cold line piping if, employees carrying out such process have completed a 40-hour separate training course in its use, in addition to training required for employees performing Class I work. The system must meet the following specifications and shall be performed by employees using the following work practices:

(i) Specifications:

(A) Piping must be surrounded on 3 sides by rigid framing.

(B) A 360 degree water spray, delivered through nozzles supplied by a high pressure separate water line, must be formed around the piping.

(C) The spray must collide to form a fine aerosol which provides a liquid barrier between workers and the ACM and PACM.

(ii) Work practices:

(A) The system must be run for at least 10 minutes before removal begins.

(B) All removal must take place within the water barrier.

(C) The system must be operated by at least three persons, one of whom must not perform removal, but must check equipment, and ensure proper operation of the system.

(D) After removal, the ACM and PACM must be bagged while still inside the water barrier.

(f) A small walk-in enclosure which accommodates no more than two persons (mini-enclosure) may be used if the disturbance or removal can be completely contained by the

enclosure with the following specifications and work practices:

(i) Specifications:

(A) The fabricated or job-made enclosure must be constructed of 6 mil plastic or equivalent.

(B) The enclosure must be placed under negative pressure by means of a HEPA filtered vacuum or similar ventilation unit.

(C) Change room. A small change room made of 6-mil-thick polyethylene plastic should be contiguous to the mini-enclosure, and is necessary to allow the worker to vacuum off his/her protective coveralls and remove them before leaving the work area. While inside the enclosure, the worker should wear Tyvek disposable coveralls or equivalent and must use the appropriate HEPA-filtered dual cartridge respiratory protection. The advantages of mini-enclosures are that they limit the spread of asbestos contamination, reduce the potential exposure of bystanders and other workers who may be working in adjacent areas, and are quick and easy to install. The disadvantage of mini-enclosures is that they may be too small to contain the equipment necessary to create a negative-pressure within the enclosure; however, the double layer of plastic sheeting will serve to restrict the release of asbestos fibers to the area outside the enclosure.

(ii) Work practices:

(A) Before use, the mini-enclosure must be inspected for leaks and smoke-tested to detect breaches, and any breaches sealed.

(B) Before reuse, the interior must be completely washed with amended water and HEPA-vacuumed.

(C) During use, air movement must be directed away from the employee's breathing zone within the mini-enclosure.

(8) Alternative control methods for Class I work. Class I work may be performed using a control method which is not referenced in subsection (2)(a) through (3)(e) of this section, or which modifies a control method referenced in subsection (2)(a) through (3)(e) of this section, if the following provisions are complied with:

(a) The control method shall enclose, contain or isolate the processes or source of airborne asbestos dust, before it enters the breathing zone of employees.

(b) A certified industrial hygienist or licensed professional engineer who is also qualified as a project designer as defined in WAC 296-62-07703, shall evaluate the work area, the projected work practices and the engineering controls and shall certify in writing that the planned control method is adequate to reduce direct and indirect employee exposure to below the PELs under worst-case conditions of use, and that the planned control method will prevent asbestos contamination outside the regulated area, as measured by clearance sampling which meets the requirements of EPA's Asbestos in Schools rule issued under AHERA, or perimeter monitoring which meets the criteria in subsection (6)(b)(ii) of this section. Where the TSI or surfacing material to be removed is 25 linear or 10 square feet or less, the evaluation required in subsection (8)(b) of this section may be performed by a competent person.

(c) Before work which involves the removal of more than 25 linear or 10 square feet of thermal system insulation

or surfacing material is begun using an alternative method which has been the subject of subsection (2)(a) through (3)(e) of this section required evaluation and certification, the employer shall send a copy of such evaluation and certification to the Department of Labor and Industries, Asbestos Certification Program, P.O. Box 44614, Olympia, Washington 98504-4614. The submission shall not constitute approval by WISHA.

(d) The evaluation of employee exposure required in WAC 296-62-07712(8) must include and be based on sampling and analytical data representing employee exposure during the use of such method under the worst-case conditions and by employees whose training and experiences are equivalent to employees who are to perform the current job.

(9) Work practices and engineering controls for Class II work.

(a) All Class II work must be supervised by a competent person as defined in WAC 296-62-07703.

(b) For all indoor Class II jobs, where the employer has not produced a negative exposure assessment according to WAC 296-62-07709(3), or where during the job, changed conditions indicate there may be exposure above the PEL or where the employer does not remove the ACM in a substantially intact state, the employer must use one of the following methods to ensure that airborne asbestos does not migrate from the regulated area:

(i) Critical barriers must be placed over all openings to the regulated area; or

(ii) The employer must use another barrier or isolation method which prevents the migration of airborne asbestos from the regulated area, as verified by perimeter area monitoring or clearance monitoring which meets the criteria set out in subsection (6)(b)(ii) of this section.

(c) Impermeable dropcloths must be placed on surfaces beneath all removal activity.

(d) All Class II asbestos work must be performed using the work practices and requirements set out above in subsection (2) of this section.

(10) Additional controls for Class II work. Class II asbestos work must also be performed by complying with the work practices and controls designated for each type of asbestos work to be performed, set out in this paragraph. Where more than one control method may be used for a type of asbestos work, the employer may choose one or a combination of designated control methods. Class II work also may be performed using a method allowed for Class I work, except that glove bags and glove boxes are allowed if they fully enclose the Class II material to be removed.

(a) For removing vinyl and asphalt flooring materials which contain ACM or for which in buildings constructed no later than 1980, the employer has not verified the absence of ACM according to WAC 296-62-07712 (10)(a)(ix). The employer must ensure that employees comply with the following work practices and that employees are trained in these practices according to WAC 296-62-07722.

(i) Flooring or its backing must not be sanded.

(ii) Vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) must be used to clean floors.

(iii) Resilient sheeting must be removed by cutting with wetting of the snip point and wetting during delamination. Rip-up of resilient sheet floor material is prohibited.

(iv) All scraping of residual adhesive and/or backing must be performed using wet methods.

(v) Dry sweeping is prohibited.

(vi) Mechanical chipping is prohibited unless performed in a negative pressure enclosure which meets the requirements of subsection (7)(a) of this section.

(vii) Tiles must be removed intact, unless the employer demonstrates that intact removal is not possible.

(viii) When tiles are heated and can be removed intact, wetting may be omitted.

(ix) Resilient flooring material including associated mastic and backing must be assumed to be asbestos-containing unless an industrial hygienist determines that it is asbestos-free using recognized analytical techniques.

(b) For removing roofing material which contains ACM the employer must ensure that the following work practices are followed:

(i) Roofing material must be removed in an intact state to the extent feasible.

(ii) Wet methods must be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards.

(iii) Cutting machines must be continuously misted during use, unless a competent person determines that misting substantially decreases worker safety.

(iv) When removing built-up roofs with asbestos-containing roofing felts and an aggregate surface using a power roof cutter, all dust resulting from the cutting operation must be collected by a HEPA dust collector, or must be HEPA vacuumed by vacuuming along the cut line. When removing built-up roofs with asbestos-containing roofing felts and a smooth surface using a power roof cutter, the dust resulting from the cutting operation must be collected either by a HEPA dust collector or HEPA vacuuming along the cut line, or by gently sweeping and then carefully and completely wiping up the still wet dust and debris left along the cut line. The dust and debris must be immediately bagged or placed in covered containers.

(v) Asbestos-containing material that has been removed from a roof must not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it must be lowered to the ground via covered, dust-tight chute, crane or hoist:

(A) Any ACM that is not intact must be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift. While the material remains on the roof it must either be kept wet, placed in an impermeable waste bag, or wrapped in plastic sheeting.

(B) Intact ACM must be lowered to the ground as soon as is practicable, but in any event no later than the end of the work shift.

(vi) Upon being lowered, unwrapped material must be transferred to a closed receptacle in such manner so as to preclude the dispersion of dust.

(vii) Roof level heating and ventilation air intake sources must be isolated or the ventilation system must be shut down.

(viii) Notwithstanding any other provision of this section, removal or repair of sections of intact roofing less than 25 square feet in area does not require use of wet methods or HEPA vacuuming as long as manual methods which do not render the material nonintact are used to remove the material and no visible dust is created by the removal method used. In determining whether a job involves less than 25 square feet, the employer must include all removal and repair work performed on the same roof on the same day.

(c) When removing cementitious asbestos-containing siding and shingles or transite panels containing ACM on building exteriors (other than roofs, where subsection (10)(b) of this section applies) the employer must ensure that the following work practices are followed:

(i) Cutting, abrading or breaking siding, shingles, or transite panels, must be prohibited unless the employer can demonstrate that methods less likely to result in asbestos fiber release cannot be used.

(ii) Each panel or shingle must be sprayed with amended water prior to removal.

(iii) Unwrapped or unbagged panels or shingles must be immediately lowered to the ground via covered dust-tight chute, crane or hoist, or placed in an impervious waste bag or wrapped in plastic sheeting and lowered to the ground no later than the end of the work shift.

(iv) Nails must be cut with flat, sharp instruments.

(d) When removing gaskets containing ACM, the employer must ensure that the following work practices are followed:

(i) If a gasket is visibly deteriorated and unlikely to be removed intact, removal must be undertaken within a glove bag as described in subsection (7)(b) of this section.

(ii) (Reserved.)

(iii) The gasket must be immediately placed in a disposal container.

(iv) Any scraping to remove residue must be performed wet.

(e) When performing any other Class II removal of asbestos-containing material for which specific controls have not been listed in subsection (10) of this section, the employer must ensure that the following work practices are complied with.

(i) The material must be thoroughly wetted with amended water prior to and during its removal.

(ii) The material must be removed in an intact state unless the employer demonstrates that intact removal is not possible.

(iii) Cutting, abrading or breaking the material must be prohibited unless the employer can demonstrate that methods less likely to result in asbestos fiber release are not feasible.

(iv) Asbestos-containing material removed, must be immediately bagged or wrapped, or kept wet until transferred to a closed receptacle, no later than the end of the work shift.

(f) Alternative work practices and controls. Instead of the work practices and controls listed in subsection (10) of this section, the employer may use different or modified engineering and work practice controls if the following provisions are complied with.

(i) The employer must demonstrate by data representing employee exposure during the use of such method under con-

ditions which closely resemble the conditions under which the method is to be used, that employee exposure will not exceed the PELs under any anticipated circumstances.

(ii) A competent person must evaluate the work area, the projected work practices and the engineering controls, and must certify in writing, that the different or modified controls are adequate to reduce direct and indirect employee exposure to below the PELs under all expected conditions of use and that the method meets the requirements of this standard. The evaluation must include and be based on data representing employee exposure during the use of such method under conditions which closely resemble the conditions under which the method is to be used for the current job, and by employees whose training and experience are equivalent to employees who are to perform the current job.

(11) Work practices and engineering controls for Class III asbestos work. Class III asbestos work must be conducted using engineering and work practice controls which minimize the exposure to employees performing the asbestos work and to bystander employees.

(a) The work must be performed using wet methods.

(b) To the extent feasible, the work must be performed using local exhaust ventilation.

(c) Where the disturbance involves drilling, cutting, abrading, sanding, chipping, braking, or sawing of thermal system insulation or surfacing material, the employer must use impermeable dropcloths, and must isolate the operation using mini-enclosures or glove bag systems according to subsection (7) of this section or another isolation method.

(d) Where the employer does not produce a "negative exposure assessment" for a job, or where monitoring results show the PEL has been exceeded, the employer must contain the area using impermeable dropcloths and plastic barriers or their equivalent, or must isolate the operation using a control system listed in and in compliance with subsection (7) of this section.

(e) Employees performing Class III jobs, which involve the disturbance of thermal system insulation or surfacing material, or where the employer does not produce a "negative exposure assessment" or where monitoring results show a PEL has been exceeded, must wear respirators which are selected, used and fitted according to provisions of WAC 296-62-07715.

(12) Class IV asbestos work. Class IV asbestos jobs must be conducted by employees trained according to the asbestos awareness training program set out in WAC 296-62-07722. In addition, all Class IV jobs must be conducted in conformity with the requirements set out in this section, mandating wet methods, HEPA vacuums, and prompt clean up of debris containing ACM and PACM.

(a) Employees cleaning up debris and waste in a regulated area where respirators are required must wear respirators which are selected, used and fitted according to provisions of WAC 296-62-07715.

(b) Employers of employees who clean up waste and debris in, and employers in control of, areas where friable thermal system insulation or surfacing material is accessible, must assume that such waste and debris contain asbestos.

(13) Alternative methods of compliance for installation, removal, repair, and maintenance of certain roofing and pipe-

line coating materials. Notwithstanding any other provision of this section, an employer who complies with all provisions of subsection (10)(a) and (b) of this section when installing, removing, repairing, or maintaining intact pipeline asphaltic wrap, or roof flashings which contain asbestos fibers encapsulated or coated by bituminous or resinous compounds will be deemed to be in compliance with this section. If an employer does not comply with all provisions of this subsection (13), or if during the course of the job the material does not remain intact, the provisions of subsection (10) of this section apply instead of this subsection (13).

(a) Before work begins and as needed during the job, a competent person who is capable of identifying asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, and who has the authority to take prompt corrective measures to eliminate such hazards, must conduct an inspection of the worksite and determine that the roofing material is intact and will likely remain intact.

(b) All employees performing work covered by this subsection (13) must be trained in a training program that meets the requirements of WAC 296-62-07722.

(c) The material must not be sanded, abraded, or ground. When manual methods are used, materials must stay intact.

(d) Material that has been removed from a roof must not be dropped or thrown to the ground. Unless the material is carried or passed to the ground by hand, it must be lowered to the ground via covered, dust-tight chute, crane or hoist. All such material must be removed from the roof as soon as is practicable, but in any event no later than the end of the work shift.

(e) Where roofing products which have been labeled as containing asbestos pursuant to WAC 296-62-07721, installed on nonresidential roofs during operations covered by this subsection (13), the employer must notify the building owner of the presence and location of such materials no later than the end of the job.

(f) All removal or disturbance of pipeline asphaltic wrap must be performed using wet methods.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07712, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.050 and [49.17.060. 97-19-014, § 296-62-07712, filed 9/5/97, effective 11/5/97; 97-01-079, § 296-62-07712, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-62-07712, filed 10/10/89, effective 11/24/89; 89-11-035 (Order 89-03), § 296-62-07712, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07712, filed 11/30/87.]

WAC 296-62-07713 Methods of compliance for asbestos activities in general industry. (1) Engineering controls and work practices.

(a) The employer must institute engineering controls and work practices to reduce and maintain employee exposure to or below the permissible exposure limits prescribed in WAC 296-62-07705, except to the extent that such controls are not feasible. Engineering controls and work practices include but are not limited to the following:

(i) Local exhaust ventilation equipped with HEPA filter dust collection systems;

(ii) Vacuum cleaners equipped with HEPA filters;

(iii) Enclosure or isolation of processes producing asbestos dust;

(iv) Use of wet methods, wetting agents, or removal encapsulants to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup;

(v) Prompt disposal of wastes contaminated with asbestos in leak-tight containers; or

(vi) Use of work practices or other engineering controls that the director can show to be feasible.

(b) Wherever the feasible engineering controls and work practices that can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limits prescribed in WAC 296-62-07705, the employer must use them to reduce employee exposure to the lowest levels achievable by these controls and must supplement them by the use of respiratory protection that complies with the requirements of WAC 296-62-07715.

(c) For the following operations, wherever feasible engineering controls and work practices that can be instituted are not sufficient to reduce the employee exposure to or below the permissible exposure limits prescribed in WAC 296-62-07705, the employer must use them to reduce employee exposure to or below 0.5 fiber per cubic centimeter of air (as an eight-hour time-weighted average) or 2.5 fibers per cubic centimeter of air for 30 minutes (short-term exposure), and must supplement them by the use of any combination of respiratory protection that complies with the requirements of WAC 296-62-07715, work practices and feasible engineering controls that will reduce employee exposure to or below the permissible exposure limits prescribed in WAC 296-62-07705: Coupling cutoff in primary asbestos cement pipe manufacturing; sanding in primary and secondary asbestos cement sheet manufacturing; grinding in primary and secondary friction product manufacturing; carding and spinning in dry textile processes; and grinding and sanding in primary plastics manufacturing.

(d) Local exhaust ventilation. Local exhaust HEPA ventilation and dust collection systems must be designed, constructed, installed, and maintained in accordance with good practices such as those found in the American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, ANSI Z9.2-1979.

(e) Particular tools. All hand-operated and power-operated tools which would produce or release fibers of asbestos so as to expose employees to levels in excess of the exposure limits prescribed in WAC 296-62-07705, such as, but not limited to, saws, scorers, abrasive wheels, and drills, must be provided with local exhaust ventilation systems which comply with (d) of this subsection. High-speed abrasive disc saws that are not equipped with appropriate engineering controls must not be used for work related to asbestos.

(f) Wet methods. Asbestos must be handled, mixed, applied, removed, cut, scored, or otherwise worked in a wet saturated state to prevent the emission of airborne fibers unless the usefulness of the product would be diminished thereby.

(g) Particular products and operations. When asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos is removed from bags, cartons, or other containers in which they are shipped, it must be either wetted,

enclosed, or ventilated so as to prevent effectively the release of airborne fibers of asbestos.

(h) Compressed air. Compressed air must not be used to remove asbestos or materials containing asbestos unless the compressed air is used in conjunction with an enclosed ventilation system designed to effectively capture the dust cloud created by the compressed air.

(2) Compliance program.

(a) Where either the time weighted average and/or excursion limit is exceeded, the employer must establish and implement a written program to reduce employee exposure to or below the permissible exposure limits by means of engineering and work practice controls as required by subsection (1) of this section, and by the use of respiratory protection where required or permitted under this section.

(b) Such programs must be reviewed and updated as necessary to reflect significant changes in the status of the employer's compliance program.

(c) Written programs must be submitted upon request for examination and copying to the director, affected employees and designated employee representatives.

(d) The employer must not use employee rotation as a means of compliance with the permissible exposure limits specified in WAC 296-62-07705.

(3) Specific compliance methods for brake and clutch repair:

(a) Engineering controls and work practices for brake and clutch repair and service. During automotive brake and clutch inspection, disassembly, repair and assembly operations, the employer must institute engineering controls and work practices to reduce employee exposure to materials containing asbestos using a negative pressure enclosure/HEPA vacuum system method or low pressure/wet cleaning method which meets the detailed requirements in WAC 296-62-07745, Appendix F. The employer may also comply using an equivalent method which follows written procedures which the employer demonstrates can achieve results equivalent to Method (1) Negative pressure enclosure/HEPA vacuum system method in WAC 296-62-07745, Appendix F. For facilities in which no more than 5 pair of brakes or 5 clutches are inspected, disassembled, repaired, or assembled per week, (4) Wet method in WAC 296-62-07745, Appendix F may be used instead of Method (1).

(b) The employer may also comply by using an equivalent method which follows written procedures, which the employer demonstrates can achieve equivalent exposure reductions as do the two "preferred methods." Such demonstration must include monitoring data conducted under workplace conditions closely resembling the process, type of asbestos containing materials, control method, work practices and environmental conditions which the equivalent method will be used, or objective data, which document that under all reasonably foreseeable conditions of brake and clutch repair applications, the method results in exposure which are equivalent to the methods in WAC 296-62-07745, Appendix F.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050, and 49.26.130. 00-06-075, § 296-62-07713, filed 3/1/00, effective 4/10/00. Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040, and 49.26.130. 99-17-026, § 296-62-07713, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-01-079, § 296-62-

07713, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-07713, filed 8/13/90, effective 9/24/90; 89-11-035 (Order 89-03), § 296-62-07713, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07713, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07713, filed 4/27/87.]

WAC 296-62-07715 Respiratory protection. (1) General. For employees who use respirators required by WAC 296-62-077 through 296-62-07747, the employer must provide respirators that comply with the requirements of this section. Respirators must be used during:

(a) Periods necessary to install or implement feasible engineering and work-practice controls;

(b) Work operations, such as maintenance and repair activities, for which engineering and work-practice controls are not feasible;

(c) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limits;

(d) Emergencies;

(e) Work operations in all regulated areas, except for construction activities which follow requirements set forth in WAC 296-62-07715 (1)(g);

(f) Work operations whenever employee exposure exceeds the permissible exposure limits;

(g) The following construction activities:

(i) Class I asbestos work;

(ii) Class II work where the ACM is not removed in a substantially intact state;

(iii) Class II and Class III work which is not performed using wet methods, except for removal of ACM from sloped roofs when a negative-exposure assessment has been made and the ACM is removed in an intact state;

(iv) Class II and Class III asbestos work for which a negative-exposure assessment has not been conducted;

(v) Class III work when TSI or surfacing ACM or PACM is being disturbed;

(vi) Class IV work performed within regulated areas where employees who are performing other work are required to wear respirators.

(2) Respirator program.

(a) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(b) The employer must provide a tight-fitting, powered, air-purifying respirator instead of any negative-pressure respirators specified in Table 1 of this section when an employee chooses to use this type of respirator and the respirator provides adequate protection to the employee.

(c) The employer must inform any employee required to wear a respirator under this section that the employee may require the employer to provide a tight-fitting, powered, air-purifying respirator instead of any negative-pressure respirator specified in Table 1 of this section.

(d) No employee must be assigned to tasks requiring the use of respirators if, based on their most recent medical examination, the examining physician determines that the employee will be unable to function normally using a respira-

tor, or that the safety or health of the employee or other employees will be impaired by the use of a respirator. Such employees must be assigned to another job or given the opportunity to transfer to a different position, the duties of which they can perform. If such a transfer position is available, the position must be with the same employer, in the same geographical area, and with the same seniority, status, and rate of pay the employee had just prior to such transfer.

(3) Respirator selection.

(a) The employer must select and provide the appropriate respirator from Table 1 of this section, and ensure that the employee uses the respirator provided.

(b) The employer must provide a half-mask, air-purifying respirator, other than a disposable respirator, that is equipped with a high-efficiency filter when the employee performs:

(i) Class II and III asbestos work and the employer has not conducted a negative-exposure assessment;

(ii) Class III asbestos work when TSI or surfacing ACM or PACM is being disturbed.

TABLE 1—RESPIRATORY PROTECTION FOR ASBESTOS FIBERS

Airborne concentration of asbestos or conditions of use	Required respirator. (See Note a.)
Not in excess of 1 f/cc (10 X PEL), or otherwise as required independent of exposure	Half-mask air-purifying respirator other than a disposable respirator, equipped with high efficiency filters. (See Note b.)
Not in excess of 5 f/cc (50 X PEL)	Full facepiece air-purifying respirator equipped with high efficiency filters.
Not in excess of 10 f/cc (100 X PEL)	Any powered air-purifying respirator equipped with high efficiency filters or any supplied-air respirator operated in continuous flow mode.
Not in excess of 100 f/cc (1,000 X PEL)	Full facepiece supplied-air respirator operated in pressure demand mode.
Greater than 100 f/cc (1,000 X PEL) or unknown concentration	Full facepiece supplied-air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus or HEPA filter egress cartridges.

Note: a. Respirators assigned for higher environmental concentrations may be used at lower concentrations.
 b. A high-efficiency filter means a filter that is capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 micrometers mean aerodynamic diameter or larger.

(4) Special respiratory protection requirements.

(a) Unless specifically identified in this subsection, respirator selection for asbestos removal, demolition, and renovation operations shall be in accordance with Table 1 of sub-

section (3) of this section. The employer shall provide and require to be worn, at no cost to the employee, a full facepiece supplied-air respirator operated in the pressure demand mode equipped with either an auxiliary positive pressure self-contained breathing apparatus or a HEPA filter egress cartridge, to employees engaged in the following asbestos operations:

(i) Inside negative pressure enclosures used for removal, demolition, and renovation of friable asbestos from walls, ceilings, vessels, ventilation ducts, elevator shafts, and other structural members, but does not include pipes or piping systems; or

(ii) Any dry removal of asbestos.

(b) For all Class I work excluded or not specified in (a)(i) and (ii) of this subsection, when a negative-exposure assessment of the area has not been produced, and the exposure assessment of the area indicates the exposure level will not exceed 1 f/cc as an 8-hour time weighted average, employers must provide the employees with one of the following respirators:

(i) A tight-fitting, powered, air-purifying respirator equipped with high-efficiency filters;

(ii) A full facepiece supplied-air respirator operated in the pressure-demand mode equipped with HEPA egress cartridges; or

(iii) A full facepiece supplied-air respirator operated in the pressure-demand mode equipped with an auxiliary positive-pressure self-contained breathing apparatus. A full facepiece supplied-air respirator operated in the pressure-demand mode equipped with an auxiliary positive-pressure self-contained breathing apparatus must be provided under such conditions when the exposure assessment indicates exposure levels above 1 f/cc as an 8-hour time weighted average.

EXCEPTION: In lieu of the supplied-air respirator required by subsection (4) of this section, an employer may provide and require to be worn, at no cost to the employee, a full facepiece supplied-air respirator operated in the continuous flow mode equipped with either an auxiliary positive pressure self-contained breathing apparatus or a back-up HEPA filter egress cartridge where daily and historical personal monitoring data indicates the concentration of asbestos fibers is not reasonably expected to exceed 10 f/cc. The continuous flow respirator shall be operated at a minimum air flow rate of six cubic feet per minute at the facepiece using respirable air supplied as required by chapter 296-62 WAC, Part E.

(5) Respirator fit testing.

(a) For each employee wearing negative pressure respirators, employers shall perform either quantitative or qualitative face fit tests at the time of initial fitting and at least annually thereafter. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn.

(b) Any supplied-air respirator facepiece equipped with a back-up HEPA filter egress cartridge shall be quantitatively fit tested (see WAC 296-62-07160 through 296-62-07162 and 296-62-07201 through 296-62-07248).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07715, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-19-014, § 296-62-07715, filed 9/5/97, effective 11/5/97; 97-01-079, § 296-62-07715, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), § 296-62-07715, filed 1/10/91, effective 2/12/91; 89-11-035 (Order 89-03), § 296-62-07715, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07715, filed 11/30/87. Statutory Authority: RCW

49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07715, filed 4/27/87.]

WAC 296-62-07717 Protective work clothing and equipment. (1) Provision and use. If an employee is exposed to asbestos above the permissible exposure limits, or where the possibility of eye irritation exists, or for which a required negative exposure assessment is not produced and for any employee performing Class I operations, the employer shall provide at no cost to the employee and require that the employee uses appropriate protective work clothing and equipment such as, but not limited to:

(a) Coveralls or similar full-body work clothing;
 (b) Gloves, head coverings, and foot coverings; and
 (c) Face shields, vented goggles, or other appropriate protective equipment which complies with WAC 296-24-07801.

(2) Removal and storage.

(a) The employer shall ensure that employees remove work clothing contaminated with asbestos only in change rooms provided in accordance with WAC 296-62-07719(1).

(b) The employer shall ensure that no employee takes contaminated work clothing out of the change room, except those employees authorized to do so for the purpose of laundering, maintenance, or disposal.

(c) Contaminated clothing. Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and be labeled in accordance with WAC 296-62-07721.

(d) Containers of contaminated protective devices or work clothing which are to be taken out of change rooms or the workplace for cleaning, maintenance, or disposal, shall bear labels in accordance with WAC 296-62-07721(6).

(3) Cleaning and replacement.

(a) The employer shall clean, launder, repair, or replace protective clothing and equipment required by this paragraph to maintain their effectiveness. The employer shall provide clean protective clothing and equipment at least weekly to each affected employee.

(b) The employer shall prohibit the removal of asbestos from protective clothing and equipment by blowing or shaking.

(c) Laundering of contaminated clothing shall be done so as to prevent the release of airborne fibers of asbestos in excess of the permissible exposure limits prescribed in WAC 296-62-07705.

(d) Any employer who gives contaminated clothing to another person for laundering shall inform such person of the requirement in (c) of this subsection to effectively prevent the release of airborne fibers of asbestos in excess of the permissible exposure limits.

(e) The employer shall inform any person who launders or cleans protective clothing or equipment contaminated with asbestos of the potentially harmful effects of exposure to asbestos.

(f) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with WAC 296-62-07721.

(4) Inspection of protective clothing for construction and shipyard work.

(a) The competent person shall examine worksuits worn by employees at least once per workshift for rips or tears that may occur during performance of work.

(b) When rips or tears are detected while an employee is working, rips and tears shall be immediately mended, or the worksuit shall be immediately replaced.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07717, filed 9/5/97, effective 11/5/97; 97-01-079, § 296-62-07717, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07717, filed 7/20/94, effective 9/20/94; 89-11-035 (Order 89-03), § 296-62-07717, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07717, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07717, filed 4/27/87.]

WAC 296-62-07719 Hygiene facilities and practices.

(1) Change rooms.

(a) The employer shall provide clean change rooms for employees required to work in regulated areas or required by WAC 296-62-07717(1) to wear protective clothing.

Exception: In lieu of the change area requirement specified in this subsection, the employer may permit employees in Class III and Class IV asbestos work, to clean their protective clothing with a portable HEPA-equipped vacuum before such employees leave the area where maintenance was performed.

(b) The employer shall ensure that change rooms are in accordance with WAC 296-24-120, and are equipped with two separate lockers or storage facilities, so separated as to prevent contamination of the employee's street clothes from his/her protective work clothing and equipment.

(2) Showers.

(a) The employer shall ensure that employees who work in negative pressure enclosures required by WAC 296-62-07712, or who work in areas where their airborne exposure is above the permissible exposure limits prescribed in WAC 296-62-07705, shower at the end of the work shift.

(b) The employer shall provide shower facilities which comply with WAC 296-24-12009(3).

(c) The employer shall ensure that employees who are required to shower pursuant to (a) of this subsection do not leave the workplace wearing any clothing or equipment worn during the work shift.

(3) Special requirements in addition to the other provisions of WAC 296-62-07719 for construction work defined in WAC 296-155-012 and for all shipyard work defined in WAC 296-304-010.

(a) Requirements for employees performing Class I asbestos jobs involving over 25 linear or 10 square feet of TSI or surfacing ACM and PACM.

(i) Decontamination areas: The employer shall establish a decontamination area that is adjacent and connected to the regulated area for the decontamination of such employees. The decontamination area shall consist of an equipment room, shower area, and clean room in series. The employer shall ensure that employees enter and exit the regulated area through the decontamination area.

(A) Equipment room. The equipment room shall be supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective equipment.

(B) Shower area. Shower facilities shall be provided which comply with WAC 296-24-12009(3), unless the

employer can demonstrate that they are not feasible. The showers shall be adjacent both to the equipment room and the clean room, unless the employer can demonstrate that this location is not feasible. Where the employer can demonstrate that it is not feasible to locate the shower between the equipment room and the clean room, or where the work is performed outdoors, the employers shall ensure that employees:

(I) Remove asbestos contamination from their worksuits in the equipment room using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or

(II) Remove their contaminated worksuits in the equipment room, then don clean worksuits, and proceed to a shower that is not adjacent to the work area.

(C) Clean change room. The clean room shall be equipped with a locker or appropriate storage container for each employee's use.

(ii) Decontamination area entry procedures. The employer shall ensure that employees:

(A) Enter the decontamination area through the clean room;

(B) Remove and deposit street clothing within a locker provided for their use; and

(C) Put on protective clothing and respiratory protection before leaving the clean room.

(D) Before entering the regulated area, the employer shall ensure that employees pass through the equipment room.

(iii) Decontamination area exit procedures. The employer shall ensure that:

(A) Before leaving the regulated area, employees shall remove all gross contamination and debris from their protective clothing;

(B) Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers;

(C) Employees shall not remove their respirators in the equipment room;

(D) Employees shall shower prior to entering the clean room. When taking a shower, employees shall be fully wetted, including the face and hair, prior to removing the respirators;

(E) After showering, employees shall enter the clean room before changing into street clothes.

(b) Requirements for Class I work involving less than 25 linear or 10 square feet of TSI or surfacing ACM and PACM, and for Class II and Class III asbestos work operations where exposures exceed a PEL or where there is no negative exposure assessment produced before the operation.

(i) The employer shall establish an equipment room or area that is adjacent to the regulated area for the decontamination of employees and their equipment which is contaminated with asbestos which shall consist of an area covered by a impermeable drop cloth on the floor or horizontal working surface.

(ii) The area must be of sufficient size as to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area (as determined by visible accumulations).

(iii) Work clothing must be cleaned with a HEPA vacuum before it is removed.

(iv) All equipment and surfaces of containers filled with ACM must be cleaned prior to removing them from the equipment room or area.

(v) The employer shall ensure that employees enter and exit the regulated area through the equipment room or area.

(c) Requirements for Class IV work. Employers shall ensure that employees performing Class IV work within a regulated area comply with hygiene practice required of employees performing work which has a higher classification within that regulated area. Otherwise employers of employees cleaning up debris and material which is TSI or surfacing ACM or identified as PACM shall provide decontamination facilities for such employees which are required by WAC 296-62-07719 (3)(b).

(d) Decontamination area for personnel shall not be used for the transportation of asbestos debris.

(e) Waste load-out procedure. The waste load-out area as required by WAC 296-62-07723 shall be used as an area for final preparation and external decontamination of waste containers, as a short term storage area for bagged waste, and as a port for transporting waste. The employer shall ensure waste containers be free of all gross contaminated material before removal from the negative-pressure enclosure. Gross contamination shall be wiped, scraped off, or washed off containers before they are placed into a two chamber air lock which is adjacent to the negative-pressure enclosure. In the first chamber, the exterior of the waste container shall be decontaminated or placed within a second waste container, and then it shall be moved into the second chamber of the air lock for temporary storage or transferred outside of the regulated area. The second waste container shall not be reused unless thoroughly decontaminated.

(4) Lunchrooms.

(a) The employer shall provide lunchroom facilities for employees who work in areas where their airborne exposure is above the time weighted average and/or excursion limit.

(b) The employer shall ensure that lunchroom facilities have a positive pressure, filtered air supply, and are readily accessible to employees.

(c) The employer shall ensure that employees who work in areas where their airborne exposure is above the time weighted average and/or excursion limit, wash their hands and faces prior to eating, drinking, or smoking.

(d) The employer shall ensure that employees do not enter lunchroom facilities with protective work clothing or equipment unless surface asbestos fibers have been removed from the clothing or equipment by vacuuming or other method that removes dust without causing the asbestos to become airborne.

(5) Smoking in work areas. The employer shall ensure that employees do not smoke in work areas where they are occupationally exposed to asbestos because of activities in that work area.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07719, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), § 296-62-07719, filed 1/10/91, effective 2/12/91; 89-11-035 (Order 89-03), § 296-62-07719, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07719, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07719, filed 4/27/87.]

WAC 296-62-07721 Communication of hazards to employees. (1) Communication of hazards to employees. General industry requirements.

(a) Introduction. This section applies to the communication of information concerning asbestos hazards in general industry. Asbestos exposure in industry occurs in a wide variety of industrial and commercial settings. Employees who manufacture asbestos-containing products may be exposed to asbestos fibers. Employees who repair and replace automotive brakes and clutches may be exposed to asbestos fibers. In addition, employees engaged in housekeeping activities in industrial facilities with asbestos product manufacturing operations, and in public and commercial buildings with installed asbestos-containing materials may be exposed to asbestos fibers. It should be noted that employees who perform housekeeping activities during and after construction activities are covered by asbestos construction work requirements in WAC 296-62-0777. Housekeeping employees, regardless of industry designation, should know whether building components they maintain may expose them to asbestos. Building owners are often the only and/or best source of information concerning the presence of previously installed asbestos-containing building materials. Therefore they, along with employers of potentially exposed employees, are assigned specific information conveying and retention duties under this section.

(b) Installed asbestos-containing material. Employers and building owners are required to treat installed TSI and sprayed-on and troweled-on surfacing materials as ACM for the purposes of this standard. These materials are designated "presumed ACM or PACM," and are defined in WAC 296-62-07703. Asphalt and vinyl flooring installed no later than 1980 also must be treated as asbestos-containing. The employer or building owner may demonstrate that PACM and flooring materials do not contain asbestos by complying with WAC 296-62-07712 (10)(a)(ix).

(c) Duties of employers and building and facility owners.

(i) Building and facility owners must determine the presence, location, and quantity of ACM and/or PACM at the worksite. Employers and building and facility owners must exercise due diligence in complying with these requirements to inform employers and employees about the presence and location of ACM and PACM.

(ii) Before authorizing or allowing any construction, renovation, remodeling, maintenance, repair, or demolition project, an owner or owner's agent must perform, or cause to be performed, a good faith inspection to determine whether materials to be worked on or removed contain asbestos. The inspection must be documented by a written report maintained on file and made available upon request to the director.

(A) The good faith inspection must be conducted by an accredited inspector.

(B) Such good faith inspection is not required if the owner or owner's agent is reasonably certain that asbestos will not be disturbed by the project or the owner or owner's agent assumes that the suspect material contains asbestos and handles the material in accordance with WAC 296-62-07701 through 296-62-07753.

(iii) The owner or owner's agent must provide, to all contractors submitting a bid to undertake any construction, renovation,

remodeling, maintenance, repair, or demolition project, the written statement either of the reasonable certainty of nondisturbance of asbestos or of assumption of the presence of asbestos. Contractors must be provided with the written report before they apply or bid to work.

(iv) Any owner or owner's agent who fails to comply with (c)(ii) and (iii) of this subsection must be subject to a mandatory fine of not less than two hundred fifty dollars for each violation. Each day the violation continues must be considered a separate violation. In addition, any construction, renovation, remodeling, maintenance, repair, or demolition which was started without meeting the requirements of this section must be halted immediately and cannot be resumed before meeting such requirements.

(v) Building and facility owners must inform employers of employees, and employers must inform employees who will perform housekeeping activities in areas which contain ACM and/or PACM of the presence and location of ACM and/or PACM in such areas which may be contacted during such activities.

(vi) Upon written or oral request, building or facility owners must make a copy of the written report required in this section available to the department of labor and industries and the collective bargaining representatives or employee representatives of any employee who may be exposed to any asbestos or asbestos-containing materials. A copy of the written report must be posted conspicuously at the location where employees report to work.

(vii) Building and facility owners must maintain records of all information required to be provided according to this section and/or otherwise known to the building owner concerning the presence, location and quantity of ACM and PACM in the building/facility. Such records must be kept for the duration of ownership and must be transferred to successive owners.

(2) Communication of hazards to employees. Requirements for construction and shipyard employment activities.

(a) Introduction. This section applies to the communication of information concerning asbestos hazards in construction and shipyard employment activities. Most asbestos-related construction and shipyard activities involve previously installed building materials. Building/vessel owners often are the only and/or best sources of information concerning them. Therefore, they, along with employers of potentially exposed employees, are assigned specific information conveying and retention duties under this section. Installed Asbestos Containing Building/Vessel Material: Employers and building/vessel owners must identify TSI and sprayed or troweled on surfacing materials as asbestos-containing unless the employer, by complying with WAC 296-62-07721(3) determines it is not asbestos containing. Asphalt or vinyl flooring/decking material installed in buildings or vessels no later than 1980 must also be considered as asbestos containing unless the employer/owner, according to WAC 296-62-07712 (10)(a)(ix) determines it is not asbestos containing. If the employer or building/vessel owner has actual knowledge or should have known, through the exercise of due diligence, that materials other than TSI and sprayed-on or troweled-on surfacing materials are asbestos containing, they must be treated as such. When communicating information to

employees according to this standard, owners and employers must identify "PACM" as ACM. Additional requirements relating to communication of asbestos work on multi-employer worksites are set out in WAC 296-62-07706.

(b) Duties of building/vessel and facility owners.

(i) Before work subject to this section is begun, building/vessel and facility owners must identify the presence, location and quantity of ACM, and/or PACM at the worksite. All thermal system insulation and sprayed on or troweled on surfacing materials in buildings/vessels or substrates constructed no later than 1980 must be identified as PACM. In addition, resilient flooring/decking material installed no later than 1980 must also be identified as asbestos containing.

(ii) Before authorizing or allowing any construction, renovation, remodeling, maintenance, repair, or demolition project, a building/vessel and facility owner or owner's agent must perform, or cause to be performed, a good faith inspection to determine whether materials to be worked on or removed contain asbestos. The inspection must be documented by a written report maintained on file and made available upon request to the director.

(A) The good faith inspection must be conducted by an accredited inspector.

(B) Such good faith inspection is not required if the building/vessel and facility owner or owner's agent assumes that the suspect material contains asbestos and handles the material in accordance with WAC 296-62-07701 through 296-62-07753 or if the owner or the owner's agent is reasonably certain that asbestos will not be disturbed by the project.

(iii) The building/vessel and facility owner or owner's agent must provide, to all contractors submitting a bid to undertake any construction, renovation, remodeling, maintenance, repair, or demolition project, the written statement either of the reasonable certainty of nondisturbance of asbestos or of assumption of the presence of asbestos. Contractors must be provided the written report before they apply or bid on work.

(iv) Any building/vessel and facility owner or owners agent who fails to comply with WAC 296-62-07721 (2)(b)(ii) and (iii) must be subject to a mandatory fine of not less than two hundred fifty dollars for each violation. Each day the violation continues must be considered a separate violation. In addition, any construction, renovation, remodeling, maintenance, repair, or demolition which was started without meeting the requirements of this section must be halted immediately and cannot be resumed before meeting such requirements.

(v) Upon written or oral request, building/vessel and facility owner or owner's agent must make a copy of the written report required in this section available to the department of labor and industries and the collective bargaining representatives or employee representatives of any employee who may be exposed to any asbestos or asbestos-containing materials. A copy of the written report must be posted conspicuously at the location where employees report to work.

(vi) Building/vessel and facility owner or owner's agent must notify in writing the following persons of the presence, location and quantity of ACM or PACM, at worksites in their buildings/facilities/vessels.

(A) Prospective employers applying or bidding for work whose employees reasonably can be expected to work in or adjacent to areas containing such material;

(B) Employees of the owner who will work in or adjacent to areas containing such material;

(C) On multi-employer worksites, all employers of employees who will be performing work within or adjacent to areas containing such materials;

(D) Tenants who will occupy areas containing such materials.

(c) Duties of employers whose employees perform work subject to this standard in or adjacent to areas containing ACM and PACM. Building/vessel and facility owner or owner's agents whose employees perform such work must comply with these provisions to the extent applicable.

(i) Before work subject to this standard is begun, building/vessel and facility owner or owner's agents must determine the presence, location, and quantity of ACM and/or PACM at the worksite according to WAC 296-62-07721 (2)(b).

(ii) Before work under this standard is performed employers of employees who will perform such work must inform the following persons of the location and quantity of ACM and/or PACM present at the worksite and the precautions to be taken to insure that airborne asbestos is confined to the area.

(A) Owners of the building/vessel or facility;

(B) Employees who will perform such work and employers of employees who work and/or will be working in adjacent areas;

(iii) Upon written or oral request, a copy of the written report required in this section must be made available to the department of labor and industries and the collective bargaining representatives or employee representatives of any employee who may be exposed to any asbestos or asbestos-containing materials. A copy of the written report must be posted conspicuously at the location where employees report to work.

(iv) Within 10 days of the completion of such work, the employer whose employees have performed work subject to this standard, must inform the building/vessel or facility owner and employers of employees who will be working in the area of the current location and quantity of PACM and/or ACM remaining in the former regulated area and final monitoring results, if any.

(d) In addition to the above requirements, all employers who discover ACM and/or PACM on a worksite must convey information concerning the presence, location and quantity of such newly discovered ACM and/or PACM to the owner and to other employers of employees working at the worksite, within 24 hours of the discovery.

(e) No contractor may commence any construction, renovation, remodeling, maintenance, repair, or demolition project without receiving a copy of the written response or statement required by WAC 296-62-07721 (2)(b). Any contractor who begins any project without the copy of the written report or statement will be subject to a mandatory fine of not less than two hundred fifty dollars per day. Each day the violation continues will be considered a separate violation.

(3) Criteria to rebut the designation of installed material as PACM.

(a) At any time, an employer and/or building/vessel owner may demonstrate, for purposes of this standard, that PACM does not contain asbestos. Building/vessel owners and/or employers are not required to communicate information about the presence of building material for which such a demonstration according to the requirements of (b) of this subsection has been made. However, in all such cases, the information, data and analysis supporting the determination that PACM does not contain asbestos, must be retained according to WAC 296-62-07727.

(b) An employer or owner may demonstrate that PACM does not contain asbestos by the following:

(i) Having a completed inspection conducted according to the requirements of AHERA (40 CFR Part 763, Subpart E) which demonstrates that the material is not ACM;

(ii) Performing tests of the material containing PACM which demonstrate that no asbestos is present in the material. Such tests must include analysis of bulk samples collected in the manner described in 40 CFR 763.86, Asbestos-containing materials in schools. The tests, evaluation and sample collection must be conducted by an accredited inspector. Analysis of samples must be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute for Standards and Technology (NIST) or the Round Robin for bulk samples administered by the American Industrial Hygiene Association (AIHA), or an equivalent nationally recognized Round Robin testing program.

(4) At the entrance to mechanical rooms/areas in which employees reasonably can be expected to enter and which contain TSI or surfacing ACM and PACM, the building/vessel and facility owner or owner's agent must post signs which identify the material which is present, its location, and appropriate work practices which, if followed, will ensure that ACM and/or PACM will not be disturbed. The employer shall ensure, to the extent feasible, that employees who come in contact with these signs can comprehend them. Means to ensure employee comprehension may include the use of foreign languages, pictographs, graphics, and awareness training.

(5) Warning signs.

(a) Warning signs that demarcate the regulated area must be provided and displayed at each location where a regulated area is required. In addition, warning signs must be posted at all approaches to regulated areas and be posted at such a distance from such a location that an employee may read the signs and take necessary protective steps before entering the area marked by the signs.

(b) The warning signs required by (a) of this subsection must bear the following information:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN
THIS AREA

(c) The employer shall ensure that employees working in and contiguous to regulated areas comprehend the warning signs required to be posted by (a) of this subsection. Means to ensure employee comprehension may include the use of foreign languages, pictographs, and graphics.

(6) Warning labels.

(a) Warning labels must be affixed to all products containing asbestos including raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, and to their containers including waste containers. Installed asbestos products must contain a visible label, except where such a label would clearly not be feasible.

(b) Labels must be printed in large, bold letters on a contrasting background.

(c) The labels must comply with the requirements of WAC 296-62-05411, and must include the following information:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
AVOID BREATHING AIRBORNE ASBESTOS FIBERS

(7) The provisions for labels required by subsection (6)(a) of this section or for material safety data sheets required by subsection (8) of this section do not apply where:

(a) Asbestos fibers have been modified by a bonding agent, coating, binder, or other material, provided that the manufacturer can demonstrate that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of fibers of asbestos in excess of the excursion limit will be released; or

(b) Asbestos is present in a product in concentrations less than 1.0 percent by weight.

(8) Material safety data sheets. Employers who are manufacturers or importers of asbestos, or asbestos products must comply with the requirements regarding development of material safety data sheets as specified in WAC 296-62-05413, except as provided by subsection (7) of this section.

(9) When a building/vessel owner/or employer identifies previously installed PACM and/or ACM, labels or signs must be affixed or posted so that employees will be notified of what materials contain PACM and/or ACM. The employer must attach such labels in areas where they will clearly be noticed by employees who are likely to be exposed, such as at the entrance to mechanical rooms/areas. Signs required by subsection (5)(a) of this section may be posted in lieu of labels so long as they contain information required for labeling. The employer must ensure, to the extent feasible, that employees who come in contact with these signs can comprehend them. Means to ensure employee comprehension may include the use of foreign languages, pictographs, graphics, and awareness training.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07721, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07721, filed 9/5/97, effective 11/5/97; 97-01-079, § 296-62-07721, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 93-01-005 (Order 92-20), § 296-62-07721, filed 12/2/92, effective 1/15/93; 91-03-044 (Order 90-18), § 296-62-07721, filed 1/10/91, effective 2/12/91; 89-21-018 (Order 89-10), § 296-62-07721, filed 10/10/89, effective 11/24/89; 89-11-035 (Order 89-03), § 296-62-07721, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07721, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07721, filed 4/27/87.]

WAC 296-62-07722 Employee information and training. (1) Certification.

(a) Only certified asbestos workers may work on an asbestos project as required in WAC 296-65-010 and 296-65-030.

(b) Only certified asbestos supervisors may supervise asbestos abatement projects as required in WAC 296-65-012 and 296-65-030.

(c) In cases where certification requirements of chapter 296-65 WAC do not apply, all employees must be trained according to the provisions of this section regardless of their exposure levels.

(d) Certification is not required for asbestos work on materials containing less than one percent asbestos.

(2) Training must be provided prior to or at the time of initial assignment, unless the employee has received equivalent training within the previous twelve months, and at least annually thereafter.

(3) Asbestos projects.

(a) Class I work must be considered an asbestos project. Only certified asbestos workers may do this work.

(b) Only certified workers may conduct Class II asbestos work that is considered an asbestos project.

(i) The following Class II asbestos work must be considered asbestos projects:

(A) All Class II asbestos work where critical barriers, equivalent isolation methods, or negative pressure enclosures are required; or

(B) All Class II asbestos work where asbestos containing materials do not stay intact (including removal of vinyl asbestos floor (VAT) or roofing materials by mechanical methods such as chipping, grinding, or sanding).

(ii) The following Class II asbestos work is not considered an asbestos project and is excluded from asbestos worker certification:

(A) All Class II asbestos work involving intact asbestos containing materials (for example, intact roofing materials, bituminous or asphalt pipeline coatings, and intact flooring/decking materials);

(B) All Class II asbestos work of less than one square foot of asbestos containing materials; or

(C) All Class II asbestos work involving asbestos-cement water pipe when the work is done in accordance with training approved by the department through the asbestos certification program (see WAC 296-65-015(4)).

(iii) Asbestos work involving the removal of one square foot or more of intact roofing materials by mechanical sawing or heavy equipment must meet the following requirements:

(A) Only certified asbestos workers may conduct mechanical sawing of intact roofing material;

(B) Noncertified asbestos workers may handle roofing dust, material and debris;

(C) Operators of heavy equipment (such as track hoes with clam shells and excavators) do not need to be certified asbestos workers in the removal or demolition of intact roofing materials.

(c) Only certified asbestos workers may conduct all Class III and Class IV asbestos work that is considered an asbestos project.

(i) The following asbestos work is considered an asbestos project:

(A) All Class III asbestos work where one square foot or more of asbestos containing materials that do not stay intact;

(B) All Class IV asbestos work where one square foot or more of asbestos containing materials that do not stay intact; or

(C) All Class III and Class IV asbestos work with pipe insulation.

(ii) Except for a project involving pipe insulation work, any project involving only Class III or Class IV asbestos work with less than one square foot of asbestos containing materials is not considered an asbestos project.

(4) Training requirements for asbestos work that is not considered an asbestos project or is excluded from asbestos worker certification.

(a) Class II asbestos work.

(i) Employers must provide eight-hours of training to employees who perform asbestos work on one generic category of asbestos containing materials (ACM). When performing asbestos work in more than one category of asbestos containing materials, additional training must be used to supplement the first eight hour training course.

(ii) The training course must include:

- Hands-on training that applies to the category of asbestos containing materials,
- Specific work practices and engineering controls related to the category of asbestos containing materials present as specified in WAC 296-62-07712, and
- All the minimum elements of subsection (5) of this section.

(b) Class III asbestos work (maintenance and custodial work in buildings containing asbestos containing materials).

(i) Employers must provide training with curriculum and training methods equivalent to the 16-hour operations and maintenance course developed by the EPA. (See 40 CFR 763.92(a)(2).) For those employees whose only affected work is Class II work as described in subsection (4)(a)(i) of this section, employers must meet this 16-hour training requirement or provide training that meets the eight hours Class II requirements in subsection (4)(a) of this section.

(ii) Sixteen hours of training must include:

- Hands-on training in the use of respiratory protection and work practices, and
- All the minimum elements of subsection (5) of this section.

(c) Class IV asbestos work (maintenance and custodial work in buildings containing asbestos-containing materials).

(i) Employers must provide at least two hours of training with curriculum and training methods equivalent to the awareness training course developed by the EPA.

(ii) Training must include:

- Available information concerning the location of PACM, ACM, asbestos-containing flooring materials or flooring materials where the absence of asbestos has not been certified,
- Instruction on how to recognize damaged, deteriorated, and delimitation of asbestos containing building materials, and
- All of the minimum elements of subsection (5) of this section.

(5) The training program must be conducted in a manner which the employee is able to understand. The employer must ensure that each employee is informed of the following:

- (a) The health effects associated with asbestos exposure;
- (b) The relationship between smoking and exposure to asbestos producing lung cancer;

(c) Methods of recognizing asbestos and quantity, location, manner of use, release (including the requirements of WAC 296-62-07721 (1)(c) and (2)(b) to presume certain building materials contain asbestos), and storage of asbestos and the specific nature of operations which could result in exposure to asbestos;

(d) The engineering controls and work practices associated with the employee's job assignment;

(e) The specific procedures implemented to protect employees from exposure to asbestos, such as appropriate work practices, housekeeping procedures, hygiene facilities, decontamination procedures, emergency and clean-up procedures (including where Class III and IV work is performed, the contents "Managing Asbestos In Place" (EPA 20T-2003, July 1990) or its equivalent in content), personal protective equipment to be used, waste disposal procedures, and any necessary instructions in the use of these controls and procedures;

(f) The purpose, proper use, and limitations of protective clothing;

(g) The purpose and a description of the medical surveillance program required by WAC 296-62-07725;

(h) The content of this standard, including appendices;

(i) The names, addresses and phone numbers of public health organizations which provide information, materials, and/or conduct programs concerning smoking cessation. The employer may distribute the list of such organizations contained in Appendix I, to comply with this requirement;

(j) The requirements for posting signs and affixing labels and the meaning of the required legends for such signs and labels; and

(k) The purpose, proper use, limitations, and other training requirements for respiratory protection as required by chapter 296-62 WAC, Part E (see WAC 296-62-07117, 296-62-07172, and 296-62-07186 through 296-62-07190).

(6) The employer must also provide, at no cost to employees who perform housekeeping operations in a facility which contains ACM or PACM, an asbestos awareness training course to all employees who are or will work in areas where ACM and/or PACM is present who work in buildings containing asbestos-containing materials, which must, at a minimum, contain the following elements:

- Health effects of asbestos,
- Locations of ACM and PACM in the building/facility,
- Recognition of ACM and PACM damage and deterioration,
- Requirements in this standard relating to housekeeping, and
- Proper response to fiber release episodes.

Each such employee must be so trained at least once a year.

(7) Access to information and training materials.

(a) The employer must make a copy of this standard and its appendices readily available without cost to all affected employees.

(b) The employer must provide, upon request, all materials relating to the employee information and training program to the director.

(c) The employer must inform all employees concerning the availability of self-help smoking cessation program material. Upon employee request, the employer must distribute such material, consisting of NIH Publication No. 89-1647, or equivalent self-help material, which is approved or published by a public health organization listed in Appendix I, WAC 296-62-07751.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050, and 49.26.130. 00-06-075, § 296-62-07722, filed 3/1/00, effective 4/10/00. Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07722, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-07722, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-01-079, § 296-62-07722, filed 12/17/96, effective 3/1/97.]

WAC 296-62-07723 Housekeeping. (1) All surfaces shall be maintained as free as practicable of accumulations of dusts and waste containing asbestos.

(2) All spills and sudden releases of material containing asbestos shall be cleaned up as soon as possible.

(3) Surfaces contaminated with asbestos may not be cleaned by the use of compressed air.

(4) Vacuuming. HEPA-filtered vacuuming equipment shall be used for vacuuming. The equipment shall be used and emptied in a manner which minimizes the reentry of asbestos into the workplace:

(5) Shoveling, dry sweeping, and dry clean-up of asbestos may be used only where vacuuming and/or wet cleaning are not feasible.

(6) Waste disposal. Waste, scrap, debris, bags, containers, equipment, and clothing contaminated with asbestos consigned for disposal, shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers. To avoid breakage, bags shall be at least six mils in thickness and shall not be dragged or slid across rough or abrasive surfaces.

(7) Waste removal. Whenever a negative-pressure enclosure is required by WAC 296-62-07712, the employer whenever feasible, shall establish a waste-load-out area that is adjacent and connected to the negative-pressure enclosure, constructed of a two chamber air lock, for the decontamination and removal of asbestos debris.

(8) Deterioration. Asbestos and asbestos containing material which has become damaged or deteriorated shall be repaired, enclosed, encapsulated, or removed.

(9) Care of asbestos-containing flooring/decking material.

(a) Sanding of asbestos-containing floor/deck material is prohibited.

(b) Stripping of finishes shall be conducted using low abrasion pads at speeds lower than 300 rpm and wet methods.

(c) Burnishing or dry buffing may be performed only on asbestos-containing flooring/decking which has sufficient finish so that the pad cannot contact the asbestos-containing material.

(d) Dust and debris in an area containing TSI or surfacing ACM/PACM or visibly deteriorated ACM, shall not be dusted or swept dry, or vacuumed without using a HEPA filter.

(10) Waste and debris and accompanying dust in an area containing accessible thermal system insulation or surfacing material or visibly deteriorated ACM:

(a) Shall not be dusted or swept dry, or vacuumed without using a HEPA filter;

(b) Shall be promptly cleaned up and disposed of in leak tight containers.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07723, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07723, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07723, filed 4/27/87.]

WAC 296-62-07725 Medical surveillance. (1) General.

(a) Employees covered. The employer shall institute a medical surveillance program for all employees who are or will be exposed to airborne concentrations of fibers of asbestos at or above the permissible exposure limits. Exception.

Employers in the construction or shipyard industries shall institute a medical surveillance program for all employees who for a combined total of 30 or more days per year are engaged in Class I, II, and III work, or are exposed at or above the permissible exposure limit for combined 30 days or more per year; or who are required by the standard to wear negative pressure respirators. For the purpose of this subsection, any day in which an employee engaged in Class II or III work or a combination thereof for one hour or less (taking into account the entire time spent on the removal operation, including cleanup), and, while doing so adheres to the work practices specified in this standard, shall not be counted.

(b) Examination by a physician.

(i) The employer shall ensure that all medical examinations and procedures are performed by or under the supervision of a licensed physician, and shall be provided without cost to the employee and at a reasonable time and place.

(ii) Persons other than licensed physicians, who administer the pulmonary function testing required by this section, shall complete a training course in spirometry sponsored by an appropriate academic or professional institution.

(2) Preplacement examinations.

(a) Except as provided by WAC 296-62-07725 (1)(a), before an employee is assigned to an occupation exposed to

airborne concentrations of asbestos, a preplacement medical examination shall be provided or made available by the employer. Examinations administered using the thirty or more days per year criteria of WAC 296-62-07725 (1)(a) shall be given within ten working days following the thirtieth day of exposure. Examinations must be given prior to assignment of employees to areas where negative-pressure respirators are worn.

(b) All examinations shall include, as a minimum, a medical and work history: A complete physical examination of all systems with special emphasis on the pulmonary, cardiovascular, and gastrointestinal systems; completion of the respiratory disease standardized questionnaire in WAC 296-62-07741, Appendix D, Part 1; a chest roentgenogram (posterior-anterior 14x17 inches); pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV_{1.0}); and any additional tests deemed appropriate by the examining physician. Interpretation and classification of chest roentgenograms shall be conducted in accordance with WAC 296-62-07743, Appendix E.

(3) Periodic examinations.

(a) Periodic medical examinations shall be made available annually.

(b) The scope of the medical examination shall be in conformance with the protocol established in subsection (2)(b) of this section, except that the frequency of chest roentgenograms shall be conducted in accordance with Table 2 of this section, and the abbreviated standardized questionnaire contained in WAC 296-62-07741, Appendix D, Part 2, shall be administered to the employee.

TABLE 2—FREQUENCY OF CHEST ROENTGENOGRAMS

Years since first exposure	Age of employee		
	15 to 35	35+ to 45	45+
0 to 10	Every 5 years	Every 5 years	Every 5 years.
10+	Every 5 years	Every 2 years	Every 1 year.

(c) If the examining physician determines that any of the examinations should be provided more frequently than specified, the employer shall provide such examinations to affected employees at the frequencies specified by the physician.

(4) Termination of employment examinations.

(a) The employer shall provide, or make available, a termination of employment medical examination for any employee who has been exposed to airborne concentrations of fibers of asbestos at or above the permissible exposure limits.

(b) The medical examination shall be in accordance with the requirements of the periodic examinations stipulated in subsection (3) of this section, and shall be given within thirty calendar days before or after the date of termination of employment.

(5) Recent examinations. No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with subsection (2), (3), or (4) of this section within the past one-year period.

(6) Information provided to the physician. The employer shall provide the following information to the examining physician:

(a) A copy of this standard and Appendices D, E, and H of WAC 296-62-07741, 296-62-07743, and 296-62-07749 respectively.

(b) A description of the affected employee's duties as they relate to the employee's exposure.

(c) The employee's representative exposure level or anticipated exposure level.

(d) A description of any personal protective and respiratory equipment used or to be used.

(e) Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

(7) Physician's written opinion.

(a) The employer shall obtain a written signed opinion from the examining physician. This written opinion shall contain the results of the medical examination and shall include:

(i) The physician's opinion as to whether the employee has any detected medical conditions that would place the employee at an increased risk of material health impairment from exposure to asbestos;

(ii) Any recommended limitations on the employee or upon the use of personal protective equipment such as clothing or respirators;

(iii) A statement that the employee has been informed by the physician of the results of the medical examination and of any medical conditions resulting from asbestos exposure that require further explanation or treatment; and

(iv) A statement that the employee has been informed by the physician of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure.

(b) The employer shall instruct the physician not to reveal in the written opinion given to the employer specific findings or diagnoses unrelated to occupational exposure to asbestos.

(c) The employer shall provide a copy of the physician's written opinion to the affected employee within thirty days from its receipt.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07725, filed 9/5/97, effective 11/5/97; 97-01-079, § 296-62-07725, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), § 296-62-07725, filed 1/10/91, effective 2/12/91; 89-11-035 (Order 89-03), § 296-62-07725, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07725, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07725, filed 4/27/87.]

WAC 296-62-07727 Recordkeeping. (1) Exposure measurements.

(a) The employer shall keep an accurate record of all measurements taken to monitor employee exposure to asbestos as prescribed in WAC 296-62-07709.

(b) This record shall include at least the following information:

(i) Name of employer;

(ii) Name of person conducting monitoring;

(iii) The date of measurement;

(iv) Address of operation or activity;

(v) Description of the operation or activity involving exposure to asbestos that is being monitored;

(vi) Personal or area sample;

(vii) Name, Social Security number, and exposure level of the employees whose exposures are represented;

(viii) Type of protective devices worn, if any;

(ix) Pump calibration date and flow rate;

(x) Total volume of air sampled;

(xi) Name and address of analytical laboratory;

(xii) Number, duration, and results (f/cc) of samples taken;

(xiii) Date of analysis; and

(xiv) Sampling and analytical methods used and evidence of their accuracy.

(c) The employer shall maintain this record for the duration of employment plus thirty years, in accordance with WAC 296-62-052.

(2) Objective data for exempted operations.

(a) Where the processing, use, or handling of products made from or containing asbestos is exempted from other requirements of this section under WAC 296-62-07709 (2)(a)(iii) and (3)(b)(i), the employer shall establish and maintain an accurate record of objective data reasonably relied upon in support of the exemption.

(b) The record shall include at least the following:

(i) The product qualifying for exemption;

(ii) The source of the objective data;

(iii) The testing protocol, results of testing, and/or analysis of the material for the release of asbestos;

(iv) A description of the operation exempted and how the data support the exemption; and

(v) Other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.

(c) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

Note: The employer may utilize the services of competent organizations such as industry trade associations and employee associations to maintain the records required by this section.

(3) Medical surveillance.

(a) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance by WAC 296-62-07725 (1)(a), in accordance with WAC 296-62-052.

(b) The record shall include at least the following information:

(i) The name and Social Security number of the employee;

(ii) Physician's written opinions;

(iii) Any employee medical complaints related to exposure to asbestos;

(iv) A copy of the information provided to the physician as required by WAC 296-62-07725(6); and

(v) A copy of the employee's medical examination results, including the medical history, questionnaire responses, results of any tests, and physicians recommendations.

(c) The employer shall ensure that this record is maintained for the duration of employment plus thirty years, in accordance with WAC 296-62-052.

(4) Training. The employer shall maintain all employee training records for one year beyond the last date of employment of that employee.

(5) Availability.

(a) The employer, upon written request, shall make all records required to be maintained by this section available to the director for examination and copying.

(b) The employer, upon request, shall make any exposure records required by subsection (1) of this section available for examination and copying to affected employees, former employees, designated representatives, and the director, in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(c) The employer, upon request, shall make employee medical records required by subsection (2) of this section available for examination and copying to the subject employee, to anyone having the specific written consent of the subject employee, and the director, in accordance with WAC 296-62-052.

(6) Transfer of records.

(a) The employer shall comply with the requirements concerning transfer of records set forth in WAC 296-62-05215.

(b) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall notify the director at least ninety days prior to disposal of records and, upon request, transmit them to the director.

(7) Data to rebut PACM. Where the building owner and employer have relied on data to demonstrate that PACM is not asbestos-containing, such data shall be maintained for as long as they are relied upon to rebut the presumption.

(8) Records of required notifications. Where the building owner has communicated and received information concerning the identification, location and quantity of ACM and PACM, written records of such notifications and their content shall be maintained by the building owner for the duration of ownership and shall be transferred to successive owners of such buildings/facilities.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050, and 49.26.130. 00-06-075, § 296-62-07727, filed 3/1/00, effective 4/10/00. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-01-079, § 296-62-07727, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07727, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07727, filed 4/27/87.]

WAC 296-62-07728 Competent person. (1) General. For all construction and shipyard work covered by this standard, the employer must designate a competent person, having the qualifications and authorities for ensuring worker safety and health as required by chapter 296-155 WAC.

(2) Required inspections by the competent person. WAC 296-155-110(9) which requires health and safety prevention programs to provide for frequent and regular inspections on the job sites, materials, and equipment to be made by the competent person, is incorporated.

(3) Additional inspections. In addition, the competent person must make frequent and regular inspections of the job sites in order to perform the duties set out below in this section. For Class I jobs, on-site inspections must be made at least once during each work shift, and at any time at employee request. For Class II and III jobs, on-site inspections must be made at intervals sufficient to assess whether

conditions have changed, and at any reasonable time at employee request.

(4) On all worksites where employees are engaged in Class I or II asbestos work, the competent person designated in accordance with WAC 296-62-07712 must perform or supervise the following duties, as applicable:

(a) Set up the regulated area, enclosure, or other containment;

(b) Ensure (by on-site inspection) the integrity of the enclosure or containment;

(c) Set up procedures to control entry and exit from the enclosure and/or area;

(d) Supervise all employee exposure monitoring required by this section and ensure that it is conducted as required by WAC 296-62-07709;

(e) Ensure that employees working within the enclosure and/or using glovebags wear protective clothing and respirators as required by WAC 296-62-07715 and 296-62-07717;

(f) Ensure through on-site supervision, that employees set up and remove engineering controls, use work practices and personal protective equipment in compliance with all requirements;

(g) Ensure that employees use the hygiene facilities and observe the decontamination procedures specified in WAC 296-62-07719;

(h) Ensure that through on-site inspection engineering controls are functioning properly and employees are using proper work practices; and

(i) Ensure that notification requirements in WAC 296-62-07721 are met.

(5) Training for competent person.

(a) For Class I and II asbestos work the competent person must be trained in all aspects of asbestos removal and handling, including:

- Abatement,
- Installation,
- Removal and handling,
- The contents of this standard,
- The identification of asbestos,
- Removal procedures where appropriate, and
- Other practices for reducing the hazard.

Such training must be the certified asbestos supervisor training specified in WAC 296-65-003, 296-65-012, and 296-65-030.

(b) For Class III and IV asbestos work:

(i) The competent person must be certified as an asbestos supervisor as prescribed in WAC 296-65-012 and 296-65-030 for Class III and IV work involving an asbestos project of 3 square feet or 3 linear feet or more of asbestos containing material.

(ii) For Class III and IV asbestos work involving less than 3 square feet or 3 linear feet of asbestos containing material, the competent person must be trained in:

- Aspects of asbestos handling appropriate for the nature of the work, to include procedures for setting up glove bags and mini-enclosures,
- Practices for reducing asbestos exposures,
- Use of wet methods,
- The contents of this standard, and
- The identification of asbestos.

Such training must include successful completion of

a course equivalent in curriculum and training method to the 16-hour Operations and Maintenance course developed by EPA for maintenance and custodial workers (see 40 CFR 763.92 (a)(2)) or its equivalent in stringency, content and length.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040, and 49.26.130. 99-17-026, § 296-62-07728, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-62-07728, filed 9/5/97, effective 11/5/97; 97-01-079, § 296-62-07728, filed 12/17/96, effective 3/1/97.]

WAC 296-62-07733 Appendices. (1) Appendices A, D, E, and F to this part are incorporated as part of this section and the contents of these appendices are mandatory.

(2) Appendices B, G, H, I, J and K to this part are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

[Statutory Authority: RCW 49.17.010, [49.17.]040 and [49.17.]050. 99-10-071, § 296-62-07733, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07733, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), § 296-62-07733, filed 1/10/91, effective 2/12/91; 87-24-051 (Order 87-24), § 296-62-07733, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07733, filed 4/27/87.]

WAC 296-62-07735 Appendix A—WISHA reference method—Mandatory. This mandatory appendix specifies the procedure for analyzing air samples for asbestos, tremolite, anthophyllite, and actinolite and specifies quality control procedures that must be implemented by laboratories performing the analysis. The sampling and analytical methods described below represent the elements of the available monitoring methods (such as Appendix B to this section, the most current version of the WISHA method ID-60, or the most current version of the NIOSH 7400 method) which WISHA considers to be essential to achieve adequate employee exposure monitoring while allowing employers to use methods that are already established within their organizations. All employers who are required to conduct air monitoring under WAC 296-62-07709 are required to utilize analytical laboratories that use this procedure, or an equivalent method, for collecting and analyzing samples.

(1) Sampling and analytical procedure.

(a) The sampling medium for air samples must be mixed cellulose ester filter membranes. These must be designated by the manufacturer as suitable for asbestos, tremolite, anthophyllite, and actinolite counting. See below for rejection of blanks.

(b) The preferred collection device is the 25-mm diameter cassette with an open-faced 50-mm electrically conductive extension cowl. The 37-mm cassette may be used if necessary but only if written justification for the need to use the 37-mm filter cassette accompanies the sample results in the employee's exposure monitoring record. Do not reuse or reload cassettes for asbestos sample collection.

(c) An air flow rate between 0.5 liter/min and 4.0 liters/min must be selected for the 25-mm cassette. If the 37-mm cassette is used, an air flow rate between 1 liter/min and 4.0 liters/min must be selected.

(d) Where possible, a sufficient air volume for each air sample must be collected to yield between one hundred and one thousand three hundred fibers per square millimeter on the membrane filter. If a filter darkens in appearance or if loose dust is seen on the filter, a second sample must be started.

(e) Ship the samples in a rigid container with sufficient packing material to prevent dislodging the collected fibers. Packing material that has a high electrostatic charge on its surface (e.g., expanded polystyrene) cannot be used because such material can cause loss of fibers to the sides of the cassette.

(f) Calibrate each personal sampling pump before and after use with a representative filter cassette installed between the pump and the calibration devices.

(g) Personal samples must be taken in the "breathing zone" of the employee (i.e., attached to or near the collar or lapel near the worker's face).

(h) Fiber counts must be made by positive phase contrast using a microscope with an 8 to 10 X eyepiece and a 40 to 45 X objective for a total magnification of approximately 400 X and a numerical aperture of 0.65 to 0.75. The microscope shall also be fitted with a green or blue filter.

(i) The microscope must be fitted with a Walton-Beckett eyepiece graticule calibrated for a field diameter of one hundred micrometers (+/-2 micrometers).

(j) The phase-shift detection limit of the microscope must be about 3 degrees measured using the HSE phase shift test slide as outlined below.

(i) Place the test slide on the microscope stage and center it under the phase objective.

(ii) Bring the blocks of grooved lines into focus.

Note: The slide consists of seven sets of grooved lines (ca. 20 grooves to each block) in descending order of visibility from sets one to seven, seven being the least visible. The requirements for asbestos, tremolite, anthophyllite, and actinolite counting are that the microscope optics must resolve the grooved lines in set three completely, although they may appear somewhat faint, and that the grooved lines in sets six and seven must be invisible. Sets four and five must be at least partially visible but may vary slightly in visibility between microscopes. A microscope that fails to meet these requirements has either too low or too high a resolution to be used for asbestos, tremolite, anthophyllite, and actinolite counting.

(iii) If the image deteriorates, clean and adjust the microscope optics. If the problem persists, consult the microscope manufacturer.

(k) Each set of samples taken will include ten percent blanks or a minimum of two blanks. These blanks must come from the same lot as the filters used for sample collection. The field blank results must be averaged and subtracted from the analytical results before reporting. Any samples represented by a blank having a fiber count in excess of the detection limit of the method being used must be rejected.

(l) The samples must be mounted by the acetone/triacetin method or a method with an equivalent index of refraction and similar clarity.

(m) Observe the following counting rules.

(i) Count only fibers equal to or longer than five micrometers. Measure the length of curved fibers along the curve.

(ii) Count all particles as asbestos, tremolite, anthophyllite, and actinolite that have a length-to-width ratio (aspect ratio) of three to one or greater.

(iii) Fibers lying entirely within the boundary of the Walton-Beckett graticule field must receive a count of one. Fibers crossing the boundary once, having one end within the circle, must receive the count of one-half. Do not count any fiber that crosses the graticule boundary more than once. Reject and do not count any other fibers even though they may be visible outside the graticule area.

(iv) Count bundles of fibers as one fiber unless individual fibers can be identified by observing both ends of an individual fiber.

(v) Count enough graticule fields to yield 100 fibers. Count a minimum of 20 fields; stop counting at 100 fields regardless of fiber count.

(n) Blind recounts must be conducted at the rate of ten percent.

(2) Quality control procedures.

(a) Intralaboratory program. Each laboratory and/or each company with more than one microscopist counting slides must establish a statistically designed quality assurance program involving blind recounts and comparisons between microscopists to monitor the variability of counting by each microscopist and between microscopists. In a company with more than one laboratory, the program must include all laboratories and must also evaluate the laboratory-to-laboratory variability.

(b) Interlaboratory program.

(i) Each laboratory analyzing asbestos, tremolite, anthophyllite, and actinolite samples for compliance determination shall implement an interlaboratory quality assurance program that as a minimum includes participation of at least two other independent laboratories. Each laboratory must participate in round robin testing at least once every six months with at least all the other laboratories in its interlaboratory quality assurance group. Each laboratory must submit slides typical of its own work load for use in this program. The round robin shall be designed and results analyzed using appropriate statistical methodology.

(ii) All laboratories should participate in a national sample testing scheme such as the Proficiency Analytical Testing Program (PAT), the Asbestos Registry sponsored by the American Industrial Hygiene Association (AIHA).

(c) All individuals performing asbestos, tremolite, anthophyllite, and actinolite analysis must have taken the NIOSH course for sampling and evaluating airborne asbestos, tremolite, anthophyllite, and actinolite dust or an equivalent course, recognized by the department.

(d) When the use of different microscopes contributes to differences between counters and laboratories, the effect of the different microscope must be evaluated and the microscope must be replaced, as necessary.

(e) Current results of these quality assurance programs must be posted in each laboratory to keep the microscopists informed.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07735, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07735, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07735, filed 11/30/87. Stat-

utory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07735, filed 4/27/87.]

WAC 296-62-07737 Appendix B—Detailed procedure for asbestos sampling and analysis—Nonmandatory.

Air

Matrix:

WISHA Permissible Exposure Limits:

Time Weighted Average	0.1 fiber/cc
Excursion Level (30 minutes)	1.0 fiber/cc

Collection Procedure:

A known volume of air is drawn through a 25-mm diameter cassette containing a mixed-cellulose ester filter. The cassette must be equipped with an electrically conductive 50-mm extension cowl. The sampling time and rate are chosen to give a fiber density of between 100 to 1,300 fibers/mm² on the filter.

Recommended Sampling Rate 0.5 to 4.0 liters/minute (L/min)

Recommended Air Volumes:

Minimum	25 L
Maximum	2,400 L

Analytical Procedure: A portion of the sample filter is cleared and prepared for asbestos fiber counting by Phase Contrast Microscopy (PCM) at 400X. Commercial manufacturers and products mentioned in this method are for descriptive use only and do not constitute endorsements by WISHA. Similar products from other sources can be substituted.

Introduction.

This method describes the collection of airborne asbestos fibers using calibrated sampling pumps with mixed-cellulose ester (MCE) filters and analysis by phase contrast microscopy (PCM). Some terms used are unique to this method and are defined below:

Asbestos: A term for naturally occurring fibrous minerals. Asbestos includes chrysotile, crocidolite, amosite (cummingtonite-grunerite asbestos), tremolite asbestos, actinolite asbestos, anthophyllite asbestos, and any of these minerals that have been chemically treated and/or altered. The precise chemical formulation of each species will vary with the location from which it was mined. Nominal compositions are listed:

Chrysotile	Mg ₃ Si ₂ O ₅ (OH) ₄
Crocidolite	Na ₂ Fe ₃ ²⁺ +Fe ₂ ³⁺ +Si ₈ O ₂₂ (OH) ₂
Amosite	(Mg,Fe) ₇ Si ₈ O ₂₂ (OH) ₂
Tremolite-actinolite	Ca ₂ (Mg,Fe) ₅ Si ₈ O ₂₂ (OH) ₂
Anthophyllite	(Mg,Fe) ₇ Si ₈ O ₂₂ (OH) ₂

Asbestos Fiber: A fiber of asbestos which meets the criteria specified below for a fiber.

Aspect Ratio: The ratio of the length of a fiber to its diameter (e.g. 3:1, 5:1 aspect ratios).

Cleavage Fragments: Mineral particles formed by comminution of minerals, especially those characterized by

parallel sides and a moderate aspect ratio (usually less than 20:1).

Detection Limit: The number of fibers necessary to be 95% certain that the result is greater than zero.

Differential Counting: The term applied to the practice of excluding certain kinds of fibers from the fiber count because they do not appear to be asbestos.

Fiber: A particle that is 5 μm or longer, with a length-to-width ratio of 3 to 1 or longer.

Field: The area within the graticule circle that is superimposed on the microscope image.

Set: The samples which are taken, submitted to the laboratory, analyzed, and for which, interim or final result reports are generated.

Tremolite, Anthophyllite, and Actinolite: The non-asbestos form of these minerals which meet the definition of a fiber. It includes any of these minerals that have been chemically treated and/or altered.

Walton-Beckett Graticule: An eyepiece graticule specifically designed for asbestos fiber counting. It consists of a circle with a projected diameter of $100 \pm 2 \mu\text{m}$ (area of about 0.00785 mm^2) with a crosshair having tic-marks at 3- μm intervals in one direction and 5- μm in the orthogonal direction. There are marks around the periphery of the circle to demonstrate the proper sizes and shapes of fibers. The disk is placed in one of the microscope eyepieces so that the design is superimposed on the field of view.

1. History.

(a) Early surveys to determine asbestos exposures were conducted using impinger counts of total dust with the counts expressed as million particles per cubic foot. The British Asbestos Research Council recommended filter membrane counting in 1969. In July 1969, the Bureau of Occupational Safety and Health published a filter membrane method for counting asbestos fibers in the United States. This method was refined by NIOSH and published as P & CAM 239. On May 29, 1971, OSHA specified filter membrane sampling with phase contrast counting for evaluation of asbestos exposures at worksites in the United States. The use of this technique was again required by OSHA in 1986. Phase contrast microscopy has continued to be the method of choice for the measurement of occupational exposure to asbestos.

(b) Principle. Air is drawn through a MCE filter to capture airborne asbestos fibers. A wedge shaped portion of the filter is removed, placed on a glass microscope slide and made transparent. A measured area (field) is viewed by PCM. All the fibers meeting a defined criteria for asbestos are counted and considered a measure of the airborne asbestos concentration.

(c) Advantages and Disadvantages

(i) There are four main advantages of PCM over other methods:

(A) The technique is specific for fibers. Phase contrast is a fiber counting technique which excludes non-fibrous particles from the analysis.

(B) The technique is inexpensive and does not require specialized knowledge to carry out the analysis for total fiber counts.

(C) The analysis is quick and can be performed on-site for rapid determination of air concentrations of asbestos fibers.

(D) The technique has continuity with historical epidemiological studies so that estimates of expected disease can be inferred from long-term determinations of asbestos exposures.

(ii) The main disadvantage of PCM is that it does not positively identify asbestos fibers. Other fibers which are not asbestos may be included in the count unless differential counting is performed. This requires a great deal of experience to adequately differentiate asbestos from non-asbestos fibers. Positive identification of asbestos must be performed by polarized light or electron microscopy techniques. A further disadvantage of PCM is that the smallest visible fibers are about $0.2 \mu\text{m}$ in diameter while the finest asbestos fibers may be as small as $0.02 \mu\text{m}$ in diameter. For some exposures, substantially more fibers may be present than are actually counted.

(d) Workplace Exposure. Asbestos is used by the construction industry in such products as shingles, floor tiles, asbestos cement, roofing felts, insulation and acoustical products. Non-construction uses include brakes, clutch facings, paper, paints, plastics, and fabrics. One of the most significant exposures in the workplace is the removal and encapsulation of asbestos in schools, public buildings, and homes. Many workers have the potential to be exposed to asbestos during these operations. About 95% of the asbestos in commercial use in the United States is chrysotile. Crocidolite and amosite make up most of the remainder. Anthophyllite and tremolite or actinolite are likely to be encountered as contaminants in various industrial products.

(e) Physical Properties. Asbestos fiber possesses a high tensile strength along its axis, is chemically inert, non-combustible, and heat resistant. It has a high electrical resistance and good sound absorbing properties. It can be weaved into cables, fabrics or other textiles, and also matted into asbestos papers, felts, or mats.

2. Range and Detection Limit.

(a) The ideal counting range on the filter is 100 to 1,300 fibers/ mm^2 . With a Walton-Beckett graticule this range is equivalent to 0.8 to 10 fibers/field. Using NIOSH counting statistics, a count of 0.8 fibers/field would give an approximate coefficient of variation (CV) of 0.13.

(b) The detection limit for this method is 4.0 fibers per 100 fields or 5.5 fibers/ mm^2 . This was determined using an equation to estimate the maximum CV possible at a specific concentration (95% confidence) and a Lower Control Limit of zero. The CV value was then used to determine a corresponding concentration from historical CV vs fiber relationships. As an example:

$$\text{Lower Control Limit (95\% Confidence)} = AC - 1.645 (CV) (AC)$$

Where:

$$\begin{aligned} AC &= \text{Estimate of the airborne fiber concentration} \\ &\quad \text{(fibers/cc) Setting the Lower Control Limit} \\ &= 0 \text{ and solving for CV:} \\ 0 &= AC - 1.645(CV)(AC) \\ CV &= 0.61 \end{aligned}$$

This value was compared with CV vs. count curves. The count at which CV = 0.61 for Leidel-Busch counting statistics 8(i) or for an OSHA Salt Lake Technical Center (OSHA-SLTC) CV curve (see Appendix A for further information) was 4.4 fibers or 3.9 fibers per 100 fields, respectively. Although a lower detection limit of 4 fibers per 100 fields is supported by the OSHA-SLTC data, both data sets support the 4.5 fibers per 100 fields value.

3. Method Performance—Precision and Accuracy. Precision is dependent upon the total number of fibers counted and the uniformity of the fiber distribution on the filter. A general rule is to count at least 20 and not more than 100 fields. The count is discontinued when 100 fibers are counted, provided that 20 fields have already been counted. Counting more than 100 fibers results in only a small gain in precision. As the total count drops below 10 fibers, an accelerated loss of precision is noted. At this time, there is no known method to determine the absolute accuracy of the asbestos analysis. Results of samples prepared through the Proficiency Analytical Testing (PAT) Program and analyzed by the OSHA-SLTC showed no significant bias when compared to PAT reference values. The PAT samples were analyzed from 1987 to 1989 (N=36) and the concentration range was from 120 to 1,300 fibers/mm².

4. Interferences. Fibrous substances, if present, may interfere with asbestos analysis. Some common fibers are:

- | | |
|-------------------------------|------------------------------|
| Fiber glass | Perlite veins. |
| Anhydrite plant fibers gypsum | Some synthetic fibers. |
| Membrane structures | Sponge spicules and diatoms. |
| Microorganisms | Wollastonite. |

The use of electron microscopy or optical tests such as polarized light, and dispersion staining may be used to differentiate these materials from asbestos when necessary.

5. Sampling.

(a) Equipment.

(i) Sample assembly. Conductive filter holder consisting of a 25-mm diameter, 3-piece cassette having a 50-mm long electrically conductive extension cowl. Backup pad, 25-mm, cellulose. Membrane filter, mixed-cellulose ester (MCE), 25-mm, plain, white, 0.8-to 1.2-µm pore size.

Notes: (A) DO NOT RE-USE CASSETTES.

(B) Fully conductive cassettes are required to reduce fiber loss to the sides of the cassette due to electrostatic attraction.

(C) Purchase filters which have been selected by the manufacturer for asbestos counting or analyze representative filters for fiber background before use. Discard the filter lot if more than 5 fibers/100 fields are found.

(D) To decrease the possibility of contamination, the sampling system (filter-backup pad-cassette) for asbestos is usually preassembled by the manufacturer.

(ii) Gel bands for sealing cassettes.

(iii) Sampling pump. Each pump must be a battery operated, self-contained unit small enough to be placed on the monitored employee and not interfere with the work being

performed. The pump must be capable of sampling at 2.5 liters per minute (L/min) for the required sampling time.

(iv) Flexible tubing, 6-mm bore.

(v) Pump calibration. Stopwatch and bubble tube/burette or electronic meter.

(b) Sampling Procedure.

(i) Seal the point where the base and cowl of each cassette meet with a gel band or tape.

(ii) Charge the pumps completely before beginning.

(iii) Connect each pump to a calibration cassette with an appropriate length of 6-mm bore plastic tubing. Do not use luer connectors—the type of cassette specified above has built-in adapters.

(iv) Select an appropriate flow rate for the situation being monitored. The sampling flow rate must be between 0.5 and 4.0 L/min for personal sampling and is commonly set between 1 and 2 L/min. Always choose a flow rate that will not produce overloaded filters.

(v) Calibrate each sampling pump before and after sampling with a calibration cassette in-line (Note: This calibration cassette should be from the same lot of cassettes used for sampling). Use a primary standard (e.g. bubble burette) to calibrate each pump. If possible, calibrate at the sampling site.

Note: If sampling site calibration is not possible, environmental influences may affect the flow rate. The extent is dependent on the type of pump used. Consult with the pump manufacturer to determine dependence on environmental influences. If the pump is affected by temperature and pressure changes, use the formula in subsection (10) of this section to calculate the actual flow rate.

(vi) Connect each pump to the base of each sampling cassette with flexible tubing. Remove the end cap of each cassette and take each air sample open face. Assure that each sample cassette is held open side down in the employee's breathing zone during sampling. The distance from the nose/mouth of the employee to the cassette should be about 10 cm. Secure the cassette on the collar or lapel of the employee using spring clips or other similar devices.

(vii) A suggested minimum air volume when sampling to determine TWA compliance is 25 L. For Excursion Limit (30 min sampling time) evaluations, a minimum air volume of 48 L is recommended.

(viii) The most significant problem when sampling for asbestos is overloading the filter with non-asbestos dust. Suggested maximum air sample volumes for specific environments are:

Environment	Air Vol. (L)
Asbestos removal operations (visible dust)	100
Asbestos removal operations (little dust)	240
Office environments	400 to 2,400

Caution: Do not overload the filter with dust. High levels of non-fibrous dust particles may obscure fibers on the filter and lower the count or make counting impossible. If more than about 25 to 30% of the field area is obscured with dust, the result may be biased low. Smaller air volumes may be necessary when there is excessive non-asbestos dust in the air. While sampling, observe the filter with a small flashlight. If there is a visible layer of dust on the filter, stop sampling, remove and seal the cassette, and replace with a new sam-

pling assembly. The total dust loading should not exceed 1 mg.

(ix) Blank samples are used to determine if any contamination has occurred during sample handling. Prepare two blanks for the first 1 to 20 samples. For sets containing greater than 20 samples, prepare blanks as 10% of the samples. Handle blank samples in the same manner as air samples with one exception: Do not draw any air through the blank samples. Open the blank cassette in the place where the sample cassettes are mounted on the employee. Hold it open for about 30 seconds. Close and seal the cassette appropriately. Store blanks for shipment with the sample cassettes.

(x) Immediately after sampling, close and seal each cassette with the base and plastic plugs. Do not touch or puncture the filter membrane as this will invalidate the analysis.

(xi) Attach a seal (OSHA-21 or equivalent) around each cassette in such a way as to secure the end cap plug and base plug. Tape the ends of the seal together since the seal is not long enough to be wrapped end-to-end. Also wrap tape around the cassette at each joint to keep the seal secure.

(c) Sample Shipment.

(i) Send the samples to the laboratory with paperwork requesting asbestos analysis. List any known fibrous interferences present during sampling on the paperwork. Also, note the workplace operation(s) sampled.

(ii) Secure and handle the samples in such that they will not rattle during shipment nor be exposed to static electricity. Do not ship samples in expanded polystyrene peanuts, vermiculite, paper shreds, or excelsior. Tape sample cassettes to sheet bubbles and place in a container that will cushion the samples without rattling.

(iii) To avoid the possibility of sample contamination, always ship bulk samples in separate mailing containers.

6. Analysis.

(a) Safety Precautions.

(i) Acetone is extremely flammable and precautions must be taken not to ignite it. Avoid using large containers or quantities of acetone. Transfer the solvent in a ventilated laboratory hood. Do not use acetone near any open flame. For generation of acetone vapor, use a spark free heat source.

(ii) Any asbestos spills should be cleaned up immediately to prevent dispersal of fibers. Prudence should be exercised to avoid contamination of laboratory facilities or exposure of personnel to asbestos. Asbestos spills should be cleaned up with wet methods and/or a High Efficiency Particulate-Air (HEPA) filtered vacuum.

Caution: Do not use a vacuum without a HEPA filter—It will disperse fine asbestos fibers in the air.

(b) Equipment.

(i) Phase contrast microscope with binocular or trinocular head.

(ii) Widefield or Huygenian 10X eyepieces (NOTE: The eyepiece containing the graticule must be a focusing eyepiece. Use a 40X phase objective with a numerical aperture of 0.65 to 0.75).

(iii) Kohler illumination (if possible) with green or blue filter.

(iv) Walton-Beckett Graticule, type G-22 with 100 ± 2 μ m projected diameter.

(v) Mechanical stage. A rotating mechanical stage is convenient for use with polarized light.

(vi) Phase telescope.

(vii) Stage micrometer with 0.01-mm subdivisions.

(viii) Phase-shift test slide, mark II (Available from PTR optics Ltd., and also McCrone).

(ix) Precleaned glass slides, 25 mm X 75 mm. One end can be frosted for convenience in writing sample numbers, etc., or paste-on labels can be used.

(x) Cover glass #1-1/2.

(xi) Scalpel (#10, curved blade).

(xii) Fine tipped forceps.

(xiii) Aluminum block for clearing filter.

(xiv) Automatic adjustable pipette, 100-to 500- μ L.

(xv) Micropipette, 5 μ L.

(c) Reagents.

(i) Acetone (HPLC grade).

(ii) Triacetin (glycerol triacetate).

(iii) Lacquer or nail polish.

(d) Standard Preparation. A way to prepare standard asbestos samples of known concentration has not been developed. It is possible to prepare replicate samples of nearly equal concentration. This has been performed through the PAT program. These asbestos samples are distributed by the AIHA to participating laboratories. Since only about one-fourth of a 25-mm sample membrane is required for an asbestos count, any PAT sample can serve as a "standard" for replicate counting.

(e) Sample Mounting.

Note: See Safety Precautions in (6)(a) before proceeding. The objective is to produce samples with a smooth (non-grainy) background in a medium with a refractive index of approximately 1.46. The technique below collapses the filter for easier focusing and produces permanent mounts which are useful for quality control and interlaboratory comparison. An aluminum block or similar device is required for sample preparation.

See Safety Precautions in (6)(a) before proceeding. The objective is to produce samples with a smooth (non-grainy) background in a medium with a refractive index of approximately 1.46. The technique below collapses the filter for easier focusing and produces permanent mounts which are useful for quality control and interlaboratory comparison. An aluminum block or similar device is required for sample preparation.

(i) Heat the aluminum block to about 70°C. The hot block should not be used on any surface that can be damaged by either the heat or from exposure to acetone.

(ii) Ensure that the glass slides and cover glasses are free of dust and fibers.

(iii) Remove the top plug to prevent a vacuum when the cassette is opened. Clean the outside of the cassette if necessary. Cut the seal and/or tape on the cassette with a razor blade. Very carefully separate the base from the extension cowl, leaving the filter and backup pad in the base.

(iv) With a rocking motion cut a triangular wedge from the filter using the scalpel. This wedge should be one-sixth to one-fourth of the filter. Grasp the filter wedge with the forceps on the perimeter of the filter which was clamped between the cassette pieces. DO NOT TOUCH the filter with

your finger. Place the filter on the glass slide sample side up. Static electricity will usually keep the filter on the slide until it is cleared.

(v) Place the tip of the micropipette containing about 200 μL acetone into the aluminum block. Insert the glass slide into the receiving slot in the aluminum block. Inject the acetone into the block with slow, steady pressure on the plunger while holding the pipette firmly in place. Wait 3 to 5 seconds for the filter to clear, then remove the pipette and slide from the aluminum block.

(vi) Immediately (less than 30 seconds) place 2.5 to 3.5 μL of triacetin on the filter (Note: Waiting longer than 30 seconds will result in increased index of refraction and decreased contrast between the fibers and the preparation. This may also lead to separation of the cover slip from the slide).

(vii) Lower a cover slip gently onto the filter at a slight angle to reduce the possibility of forming air bubbles. If more than 30 seconds have elapsed between acetone exposure and triacetin application, glue the edges of the cover slip to the slide with lacquer or nail polish.

(viii) If clearing is slow, warm the slide for 15 min on a hot plate having a surface temperature of about 50°C to hasten clearing. The top of the hot block can be used if the slide is not heated too long.

(ix) Counting may proceed immediately after clearing and mounting are completed.

(f) Sample Analysis. Completely align the microscope according to the manufacturer's instructions. Then, align the microscope using the following general alignment routine at the beginning of every counting session and more often if necessary.

(i) Alignment.

(A) Clean all optical surfaces. Even a small amount of dirt can significantly degrade the image.

(B) Rough focus the objective on a sample.

(C) Close down the field iris so that it is visible in the field of view. Focus the image of the iris with the condenser focus. Center the image of the iris in the field of view.

(D) Install the phase telescope and focus on the phase rings. Critically center the rings. Misalignment of the rings results in astigmatism which will degrade the image.

(E) Place the phase-shift test slide on the microscope stage and focus on the lines. The analyst must see line set 3 and should see at least parts of 4 and 5 but, not see line set 6 or 6. A microscope/microscopist combination which does not pass this test may not be used.

(ii) Counting Fibers.

(A) Place the prepared sample slide on the mechanical stage of the microscope. Position the center of the wedge under the objective lens and focus upon the sample.

(B) Start counting from one end of the wedge and progress along a radial line to the other end (count in either direction from perimeter to wedge tip). Select fields randomly, without looking into the eyepieces, by slightly advancing the slide in one direction with the mechanical stage control.

(C) Continually scan over a range of focal planes (generally the upper 10 to 15 μm of the filter surface) with the fine

focus control during each field count. Spend at least 5 to 15 seconds per field.

(D) Most samples will contain asbestos fibers with fiber diameters less than $1\ \mu\text{m}$. Look carefully for faint fiber images. The small diameter fibers will be very hard to see. However, they are an important contribution to the total count.

(E) Count only fibers equal to or longer than $5\ \mu\text{m}$. Measure the length of curved fibers along the curve.

(F) Count fibers which have a length to width ratio of 3:1 or greater.

(G) Count all the fibers in at least 20 fields. Continue counting until either 100 fibers are counted or 100 fields have been viewed; whichever occurs first. Count all the fibers in the final field.

(H) Fibers lying entirely within the boundary of the Walton-Beckett graticule field receive a count of 1. Fibers crossing the boundary once, having one end within the circle receive a count of $1/2$. Do not count any fiber that crosses the graticule boundary more than once. Reject and do not count any other fibers even though they may be visible outside the graticule area. If a fiber touches the circle, it is considered to cross the line.

(I) Count bundles of fibers as one fiber unless individual fibers can be clearly identified and each individual fiber is clearly not connected to another counted fiber.

(J) Record the number of fibers in each field in a consistent way such that filter non-uniformity can be assessed.

(K) Regularly check phase ring alignment.

(L) When an agglomerate (mass of material) covers more than 25% of the field of view, reject the field and select another. Do not include it in the number of fields counted.

(M) Perform a "blind recount" of 1 in every 10 filter wedges (slides). Re-label the slides using a person other than the original counter.

(g) Fiber Identification. As previously mentioned in (1)(c), PCM does not provide positive confirmation of asbestos fibers. Alternate differential counting techniques should be used if discrimination is desirable. Differential counting may include primary discrimination based on morphology, polarized light analysis of fibers, or modification of PCM data by Scanning Electron or Transmission Electron Microscopy. A great deal of experience is required to routinely and correctly perform differential counting. It is discouraged unless it is legally necessary. Then, only if a fiber is obviously not asbestos should it be excluded from the count. Further discussion of this technique can be found in reference 8(j). If there is a question whether a fiber is asbestos or not, follow the rule: "WHEN IN DOUBT, COUNT."

(h) Analytical Recommendations—Quality Control System.

(i) All individuals performing asbestos analysis must have taken the NIOSH course for sampling and evaluating airborne asbestos or an equivalent course.

(ii) Each laboratory engaged in asbestos counting must set up a slide trading arrangement with at least two other laboratories in order to compare performance and eliminate inbreeding of error. The slide exchange occurs at least semi-annually. The round robin results must be posted where all analysts can view individual analyst's results.

(iii) Each laboratory engaged in asbestos counting must participate in the Proficiency Analytical Testing Program, the Asbestos Analyst Registry or equivalent.

(iv) Each analyst must select and count prepared slides from a "slide bank". These are quality assurance counts. The slide bank must be prepared using uniformly distributed samples taken from the workload. Fiber densities should cover the entire range routinely analyzed by the laboratory. These slides are counted blind by all counters to establish an original standard deviation. This historical distribution is compared with the quality assurance counts. A counter must have 95% of all quality control samples counted within three standard deviations of the historical mean. This count is then integrated into a new historical mean and standard deviation for the slide. The analyses done by the counters to establish the slide bank may be used for an interim quality control program if the data are treated in a proper statistical fashion.

7. Calculations.

(a) Calculate the estimated airborne asbestos fiber concentration on the filter sample using the following formula:

$$AC = \frac{\left[\left(\frac{FB}{FL} \right) - \left(\frac{BFB}{BFL} \right) \right] \times ECA}{1000 \times FR \times T \times MFA}$$

Where:

AC	=	Airborne fiber concentration
FB	=	Total number of fibers greater than 5 μm counted
FL	=	Total number of fields counted on the filter
BFB	=	Total number of fibers greater than 5 μm counted in the blank
BFL	=	Total number of fields counted on the blank
ECA	=	Effective collecting area of filter (385 mm ² nominal for a 25-mm filter.)
FR	=	Pump flow rate (L/min)
MFA	=	Microscope count field area (mm ²). This is 0.00785 mm ² for a Walton-Beckett Graticule.
T	=	Sample collection time (min)
1,000	=	Conversion of L to cc

Note: The collection area of a filter is seldom equal to 385 mm². It is appropriate for laboratories to routinely monitor the exact diameter using an inside micrometer. The collection area is calculated according to the formula: Area = π(d/2)²

(b) Short-cut Calculation

Since a given analyst always has the same interpupillary distance, the number of fields per filter for a particular analyst will remain constant for a given size filter. The field size for that analyst is constant (i.e. the analyst is using an assigned microscope and is not changing the reticle). For example, if the exposed area of the filter is always 385 mm² and the size of the field is always 0.00785 mm², the number

of fields per filter will always be 49,000. In addition it is necessary to convert liters of air to cc. These three constants can then be combined such that ECA/(1,000 X MFA) = 49. The previous equation simplifies to:

$$AC = \frac{\left(\frac{FB}{FL} \right) - \left(\frac{BFB}{BFL} \right) \times 4}{FR \times T}$$

(c) Recount Calculations. As mentioned in step 13 of 6 (f)(ii), a "blind recount" of 10% of the slides is performed. In all cases, differences will be observed between the first and second counts of the same filter wedge. Most of these differences will be due to chance alone, that is, due to the random variability (precision) of the count method. Statistical recount criteria enables one to decide whether observed differences can be explained due to chance alone or are probably due to systematic differences between analysts, microscopes, or other biasing factors. The following recount criterion is for a pair of counts that estimate AC in fibers/cc. The criterion is given at the type-I error level. That is, there is 5% maximum risk that we will reject a pair of counts for the reason that one might be biased, when the large observed difference is really due to chance. Reject a pair of counts if:

$$\left| \sqrt{AC_2} - \sqrt{AC_1} \right| > 2.78 \times \left(\sqrt{AC_{avg}} \right) \times CV_F$$

Where:

AC ₁	=	lower estimated airborne fiber concentration
AC ₂	=	higher estimated airborne fiber concentration
AC _{avg}	=	average of the two concentration estimates
CV _{FB}	=	CV for the average of the two concentration estimates

If a pair of counts are rejected by this criterion then, recount the rest of the filters in the submitted set. Apply the test and reject any other pairs failing the test. Rejection shall include a memo to the industrial hygienist stating that the sample failed a statistical test for homogeneity and the true air concentration may be significantly different than the reported value.

(d) Reporting Results. Report results to the industrial hygienist as fibers/cc. Use two significant figures. If multiple analyses are performed on a sample, an average of the results is to be reported unless any of the results can be rejected for cause.

8. References.

(a) Dreesen, W.C., et al, U.S. Public Health Service: A Study of Asbestosis in the Asbestos Textile Industry, (Public Health Bulletin No. 241), US Treasury Dept., Washington, DC, 1938.

(b) Asbestos Research Council: The Measurement of Airborne Asbestos Dust by the Membrane Filter Method (Technical Note), Asbestos Research Council, Rockdale, Lancashire, Great Britain, 1969.

(c) Bayer, S.G., Zumwalde, R.D., Brown, T.A., Equipment and Procedure for Mounting Millipore Filters and Counting Asbestos Fibers by Phase Contrast Microscopy, Bureau of Occupational Health, U.S. Dept. of Health, Education and Welfare, Cincinnati, OH, 1969.

(d) NIOSH Manual of Analytical Methods, 2nd ed., Vol. 1 (DHEW/NIOSH Pub. No. 77-157-A), National Institute for Occupational Safety and Health, Cincinnati, OH, 1977, pp.239-1-239-21.

(e) Asbestos, Code of Federal Regulations 29 CFR 1910.1001. 1971.

(f) Occupational Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite. Final Rule, Federal Register 51: 119 (20 June 1986). pp.22612-22790.

(g) Asbestos, Tremolite, Anthophyllite, and Actinolite, Code of Federal Regulations 1910.1001. 1988. pp 711-752.

(h) Criteria for a Recommended Standard—Occupational Exposure to Asbestos (DHEW/NIOSH Pub. No. HSM 72-10267), National Institute for Occupational Safety and Health NIOSH, Cincinnati, OH, 1972. pp. III-1-III-24.

(i) Leidel, N.A., Bayer, S.G., Zumwalde, R.D., Busch, K.A., USPHS/NIOSH Membrane Filter Method for Evaluating Airborne Asbestos Fibers (DHEW/NIOSH Pub. No. 79-127). National Institute for Occupational Safety and Health, Cincinnati, OH, 1979.

(j) Dixon, W.C., Applications of Optical Microscopy in Analysis of Asbestos and Quartz, Analytical Techniques in Occupational Health Chemistry, edited by D.D. Dollberg and A.W. Verstuyft. Wash. D.C.: American Chemical Society, (ACS Symposium Series 120) 1980. pp. 13-41.

9. Quality Control. The OSHA asbestos regulations require each laboratory to establish a quality control program. The following is presented as an example of how the OSHA-SLTC constructed its internal CV curve as part of meeting this requirement. Data for the CV curve shown below is from 395 samples collected during OSHA compliance inspections and analyzed from October 1980 through April 1986. Each sample was counted by 2 to 5 different counters independently of one another. The standard deviation and the CV statistic was calculated for each sample. This data was then plotted on a graph of CV vs. fibers/mm². A least squares regression was performed using the following equation:

$$CV = \text{antilog}_{10}[A(\log_{10}(x))^2 + B(\log_{10}(x)) + C]$$

Where:

x = the number of fibers/mm²

Application of least squares gave:

A = 0.182205

B = -0.973343

C = 0.327499

Using these values, the equation becomes:

$$CV = \text{antilog}_{10}[0.182205(\log_{10}(x))^2 - 0.973343(\log_{10}(x)) + 0.327499].$$

10. Sampling Pump Flow Rate Corrections. This correction is used if a difference greater than 5% in ambient temperature and/or pressure is noted between calibration and sampling sites and the pump does not compensate for the differences.

(2001 Ed.)

$$Q_{act} = Q_{cal} \times \sqrt{\left(\frac{P_{cal}}{P_{act}}\right) \times \left(\frac{T_{act}}{T_{cal}}\right)}$$

Where:

- Q_{act} = actual flow rate
- Q_{cal} = calibrated flow rate (if a rotameter was used, the rotameter value)
- P_{cal} = uncorrected air pressure at calibration
- P_{act} = uncorrected air pressure at sampling site
- T_{act} = temperature at sampling site (K)
- T_{cal} = temperature at calibration (K)

11. Walton-Beckett Graticule

When ordering the Graticule for asbestos counting, specify the exact disc diameter needed to fit the ocular of the microscope and the diameter (mm) of the circular counting area. Instructions for measuring the dimensions necessary are listed:

- (a) Insert any available graticule into the focusing eyepiece and focus so that the graticule lines are sharp and clear.
- (b) Align the microscope.
- (c) Place a stage micrometer on the microscope object stage and focus the microscope on the graduated lines.
- (d) Measure the magnified grid length, PL (μm), using the stage micrometer.
- (e) Remove the graticule from the microscope and measure its actual grid length, AL (mm). This can be accomplished by using a mechanical stage fitted with verniers, or a jeweler's loupe with a direct reading scale.
- (f) Let D=100 μm. Calculate the circle diameter, d_c (mm), for the Walton-Beckett graticule and specify the diameter when making a purchase:

$$d_c = \frac{AL \times D}{PL}$$

Example: If PL = 108 μm, AL = 2.93 mm and D = 100 μm, then,

$$d_c = (2.93 \times 100)/108 = 2.71 \text{ mm}$$

(g) Each eyepiece-objective-reticle combination on the microscope must be calibrated. Should any of the three be changed (by zoom adjustment, disassembly, replacement, etc.), the combination must be recalibrated. Calibration may change if interpupillary distance is changed. Measure the field diameter, D (acceptable range: 100 ± 2 μm) with a stage micrometer upon receipt of the graticule from the manufacturer. Determine the field area (mm²).

$$\text{Field Area} = \pi(D/2)^2$$

If D = 100 μm = 0.1 mm, then

$$\text{Field Area} = \pi(0.1 \text{ mm}/2)^2 = 0.00785 \text{ mm}^2$$

The Graticule is available from: Graticules Ltd., Morley Road, Tonbridge TN9 1RN, Kent, England (Telephone 011-44-732-359061). Also available from PTR Optics Ltd., 145 Newton Street, Waltham, MA 02154 [telephone (617) 891-

6000] or McCrone Accessories and Components, 2506 S. Michigan Ave., Chicago, IL 60616 [phone (312) 842-7100]. The graticule is custom made for each microscope.

BILLING CODE 4510-26-P

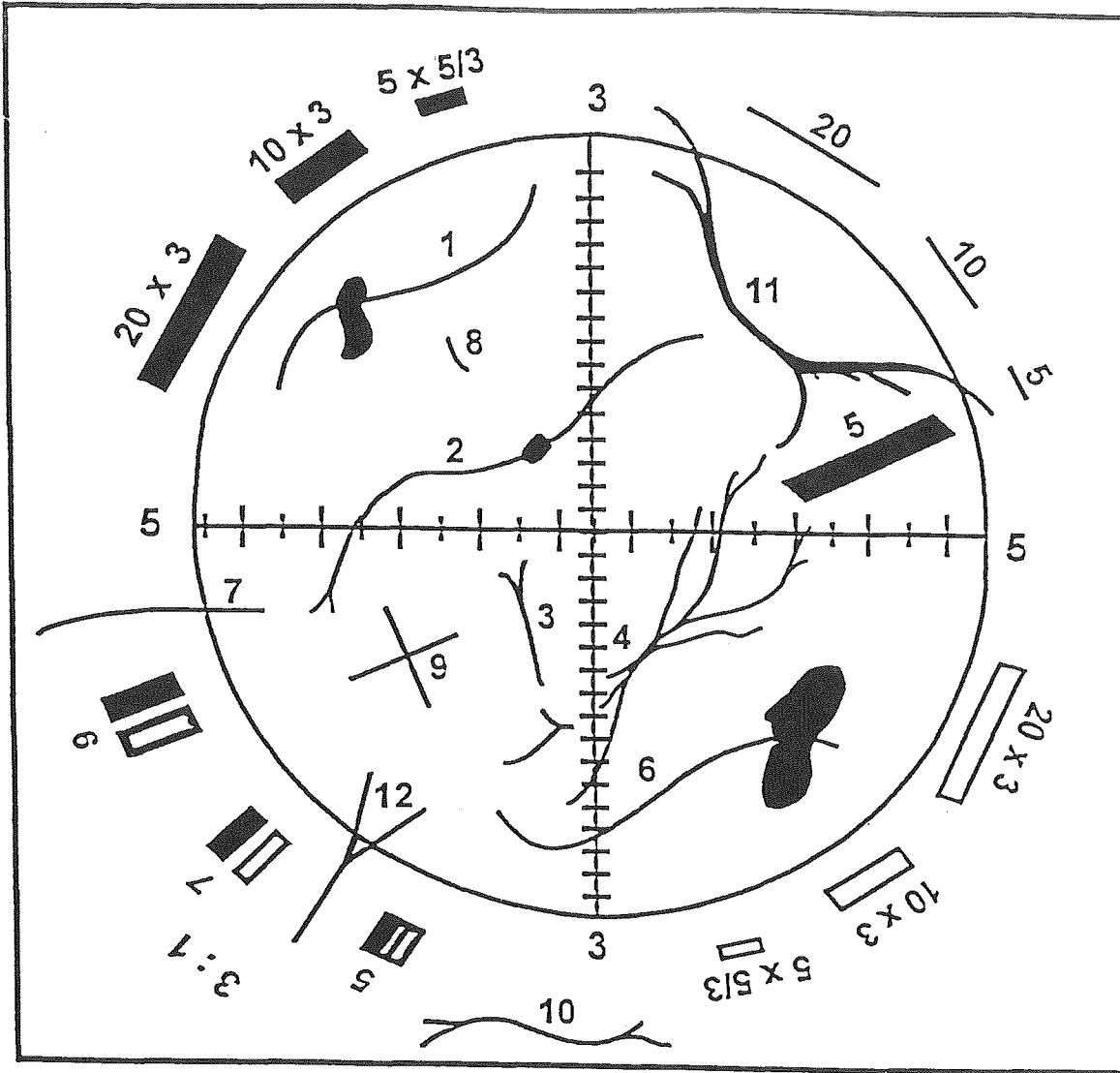


Figure 1: Walton-Beckett Graticule with some explanatory fibers.
Counts for the Fibers in Figure

Structure No.	Count	Explanation
1 to 6	1	Single fibers all contained within the circle.
7	1/2	Fiber crosses circle once.
8	0	Fiber too short.
9	2	Two crossing fibers.
10	0	Fiber outside graticule.
11	0	Fiber crosses graticule twice.
12	1/2	Although split, fiber only crosses once.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-62-07737, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07737, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07737, filed 11/30/87. Stat-

utory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07737, filed 4/27/87.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-62-07741 Appendix D—Medical questionnaires—Mandatory. This mandatory appendix contains the medical questionnaires that must be administered to all employees who are exposed to asbestos, tremolite, anthophyllite, and actinolite, or a combination of these minerals above the permissible exposure limit (0.1 f/cc), and who will therefore be included in their employer's medical surveillance program. Part 1 of the appendix contains the initial medical questionnaire, which must be obtained for all new hires who will be covered by the medical surveillance requirements. Part 2 includes the abbreviated periodical medical questionnaire, which must be administered to all employees who are provided periodic medical examinations under the medical surveillance provisions of the standard.

Part 1

INITIAL MEDICAL QUESTIONNAIRE

1. NAME

2. SOCIAL SECURITY #

1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---

3. CLOCK NUMBER

10	11	12	13	14	15
----	----	----	----	----	----

4. PRESENT OCCUPATION

5. PLANT

6. ADDRESS

7. (Zip Code)

8. TELEPHONE NUMBER

9. INTERVIEWER

10. DATE

16	17	18	19	20	21
----	----	----	----	----	----

11. Date of birth

Month	Day	Year	22	23	24	25	26	27
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12. Place of birth

13. Sex

1. Male . . .
2. Female . . .

14. What is your marital status?

1. Single . . .	4. Separated/
2. Married . . .	Divorced . . .
3. Widowed . . .	

15. Race

1. White . . .	4. Hispanic . . .
2. Black . . .	5. Indian . . .
3. Asian . . .	6. Other . . .

16. What is the highest grade completed in school?
(For example 12 years is completion of high school)

OCCUPATIONAL HISTORY

17 A. Have you ever worked full time (30 hours per week or more) for 6 months or more? 1. Yes . . . 2. No . . .

IF YES TO 17A:

B. Have you ever worked for a year or more in any dusty job? 1. Yes . . . 2. No . . . 3. Does not apply . . .

Specify job/industry Total years worked

Was dust exposure: 1. Mild . . . 2. Moderate . . . 3. Severe . . .

C. Have you ever been exposed to gas or chemical fumes in your work? 1. Yes . . . 2. No . . .

Specify job/ industry Total years worked

Was exposure: 1. Mild . . . 2. Moderate . . . 3. Severe . . .

D. What has been your usual occupation or job—the one you have worked at the longest?

1. Job occupation
2. Number of years employed in this occupation
3. Position/job title
4. Business, field or industry

(Record on lines the years in which you have worked in any of these industries, e.g., 1960-1969.)

Have you ever worked:

E. In a mine?	YES	NO
F. In a quarry?	<input type="checkbox"/>	<input type="checkbox"/>
G. In a foundry?	<input type="checkbox"/>	<input type="checkbox"/>

H. In a pottery?	<input type="checkbox"/>	<input type="checkbox"/>
I. In a cotton, flax or hemp mill?	<input type="checkbox"/>	<input type="checkbox"/>
J. With asbestos?	<input type="checkbox"/>	<input type="checkbox"/>

18. PAST MEDICAL HISTORY

	YES	NO
A. Do you consider yourself to be in good health?	<input type="checkbox"/>	<input type="checkbox"/>
If "NO" state reason		
B. Have you any defect in vision?	<input type="checkbox"/>	<input type="checkbox"/>
If "YES" state nature of defect		
C. Have you any hearing defect?	<input type="checkbox"/>	<input type="checkbox"/>
If "YES" state nature of defect		
D. Are you suffering from or have you ever suffered from:		
a. Epilepsy (or fits, seizures, convulsions)?	<input type="checkbox"/>	<input type="checkbox"/>
b. Rheumatic fever?	<input type="checkbox"/>	<input type="checkbox"/>
c. Kidney disease?	<input type="checkbox"/>	<input type="checkbox"/>
d. Bladder disease?	<input type="checkbox"/>	<input type="checkbox"/>
e. Diabetes?	<input type="checkbox"/>	<input type="checkbox"/>
f. Jaundice	<input type="checkbox"/>	<input type="checkbox"/>

19. CHEST COLDS AND CHEST ILLNESSES

19A. If you get a cold, does it usually go to your chest? (Usually means more than 1/2 the time.) 1. Yes . . . 2. No . . . 3. Don't get colds . . .

20A. During the past 3 years, have you had any chest illnesses that have kept you off work, indoors at home, or in bed? 1. Yes . . . 2. No . . .

IF YES TO 20A:

B. Did you produce phlegm with any of these chest illnesses? 1. Yes . . . 2. No . . . 3. Does not apply . . .

C. In the last 3 years, how many such illnesses with (increased) phlegm did you have which lasted a week or more? Number of illnesses . . . No such illnesses . . .

21. Did you have any lung trouble before the age of 16? 1. Yes . . . 2. No . . .

22. Have you ever had any of the following?

1A. Attacks of bronchitis? 1. Yes . . . 2. No . . .

IF YES TO 1A:

B. Was it confirmed by a doctor? 1. Yes . . . 2. No . . . 3. Does not apply . . .

C. At what age was your first attack? Age in years . . . Does not apply . . .

2A. Pneumonia? (include broncho-pneumonia) 1. Yes . . . 2. No . . .

IF YES TO 2A:

B. Was it confirmed by a doctor? 1. Yes . . . 2. No . . . 3. Does not apply . . .

C. At what age did you first have it? Age in years . . . Does not apply . . .

3A. Hay fever? 1. Yes . . . 2. No . . .

IF YES TO 3A:

B. Was it confirmed by a doctor? 1. Yes . . . 2. No . . . 3. Does not apply . . .

C. At what age did it start? Age in years . . . Does not apply . . .

23A. Have you ever had chronic bronchitis? 1. Yes . . . 2. No . . .

IF YES TO 23A:

B. Do you still have it? 1. Yes . . . 2. No . . . 3. Does not apply . . .

C. Was it confirmed by a doctor? 1. Yes . . . 2. No . . . 3. Does not apply . . .

D. At what age did it start? Age in years . . . Does not apply . . .

24A. Have you ever had emphysema? 1. Yes . . . 2. No . . .

IF YES TO 24A:

B. Do you still have it? 1. Yes . . . 2. No . . . 3. Does not apply . . .

C. Was it confirmed by a doctor? 1. Yes . . . 2. No . . . 3. Does not apply . . .

D. At what age did it start? Age in years . . . Does not apply . . .

25A. Have you ever had asthma? 1. Yes . . . 2. No . . .

IF YES TO 25A:

- B. Do you still have it? 1. Yes . . . 2. No . . . 3. Does not apply. . .
- C. Was it confirmed by a doctor? 1. Yes . . . 2. No . . . 3. Does not apply. . .
- D. At what age did it start? Age in years. . . Does not apply. . .
- E. If you no longer have it, at what age did it stop? Age stopped. . . Does not apply. . .
- 26. Have you ever had:
 - A. Any other chest illness? 1. Yes . . . 2. No . . . If yes, please specify
 - B. Any chest operations? 1. Yes . . . 2. No . . . If yes, please specify
 - C. Any chest injuries? 1. Yes . . . 2. No . . . If yes, please specify.
- 27A. Has a doctor ever told you that you had heart trouble? 1. Yes . . . 2. No . . . IF YES TO 27A:
 - B. Have you ever had treatment for heart trouble in the past 10 years? 1. Yes . . . 2. No . . . 3. Does not apply. . .
- 28A. Has a doctor ever told you that you had high blood pressure? 1. Yes . . . 2. No . . . IF YES TO 28A:
 - B. Have you had any treatment for high blood pressure (hypertension) in the past 10 years? 1. Yes . . . 2. No . . . 3. Does not apply. . .
- 29. When did you last have your chest x-rayed? (Year) 25 26 27 28
- 30. Where did you last have your chest x-rayed (if known)? What was the outcome?

FAMILY HISTORY

- 31. Were either of your natural parents ever told by a doctor that they had a chronic lung condition such as:

	FATHER			MOTHER		
	1. Yes	2. No	3. Don't Know	1. Yes	2. No	3. Don't Know
A. Chronic Bronchitis?
B. Emphysema?
C. Asthma?
D. Lung cancer?
E. Other chest conditions?
F. Is parent currently alive?
G. Please specify	...	Age if living	...	...	Age if living	...
	...	Age at death	...	...	Age at death	...
	...	Don't Know	...	...	Don't Know	...
- H. Please specify cause of death

COUGH

- 32A. Do you usually have a cough? 1. Yes . . . 2. No . . . (Count a cough with first smoke or on first going out of doors. Exclude clearing of throat.) (If no, skip to question 32C.)
 - B. Do you usually cough as much as 4 to 6 times a day 4 or more days out of the week? 1. Yes . . . 2. No . . .
 - C. Do you usually cough at all on getting up or first thing in the morning? 1. Yes . . . 2. No . . .
 - D. Do you usually cough at all during the rest of the day or at night? 1. Yes . . . 2. No . . .
- IF YES TO ANY OF ABOVE (32A, B, C, OR D), ANSWER THE FOLLOWING. IF NO TO ALL, CHECK DOES NOT APPLY AND SKIP TO NEXT PAGE
- E. Do you usually cough like this on most days for 3 consecutive months or more during the year? 1. Yes . . . 2. No . . . 3. Does not apply. . .
 - F. For how many years have you had the cough? Number of years. . . Does not apply. . .

- 33A. Do you usually bring up phlegm from your chest? (Count phlegm with the first smoke or on first going out of doors. Exclude phlegm from the nose. Count swallowed phlegm.) (If no, skip to 33C.) 1. Yes . . . 2. No . . .
 - B. Do you usually bring up phlegm like this as much as twice a day 4 or more days out of the week? 1. Yes . . . 2. No . . .
 - C. Do you usually bring up phlegm at all on getting up or first thing in the morning? 1. Yes . . . 2. No . . .
 - D. Do you usually bring up phlegm at all during the rest of the day or at night? 1. Yes . . . 2. No . . .
- IF YES TO ANY OF THE ABOVE (33A, B, C, OR D), ANSWER THE FOLLOWING: IF NO TO ALL, CHECK DOES NOT APPLY AND SKIP TO 34A.
- E. Do you bring up phlegm like this on most days for 3 consecutive months or more during the year? 1. Yes . . . 2. No . . . 3. Does not apply. . .
 - F. For how many years have you had trouble with phlegm? Number of years. . . Does not apply. . .

EPISODES OF COUGH AND PHLEGM

- 34A. Have you had periods or episodes of (increased*) cough and phlegm lasting for 3 weeks or more each year?*(For persons who usually have cough and/or phlegm.) 1. Yes . . . 2. No . . . IF YES TO 34A:
 - B. For how long have you had at least 1 such episode per year? Number of years. . . Does not apply. . .

WHEEZING

- 35A. Does your chest ever sound wheezy or whistling:
 - 1. When you have a cold? 1. Yes . . . 2. No . . .
 - 2. Occasionally apart from colds? 1. Yes . . . 2. No . . .
 - 3. Most days or nights? 1. Yes . . . 2. No . . .
 IF YES TO 1, 2, OR 3 IN 35A:
 - B. For how many years has this been present? Number of years. . . Does not apply. . .
- 36A. Have you ever had an attack of wheezing that has made you feel short of breath? 1. Yes . . . 2. No . . . IF YES TO 36A:
 - B. How old were you when you had your first such attack? Age in years . . . Does not apply . . .
 - C. Have you had 2 or more such episodes? 1. Yes . . . 2. No . . . 3. Does not apply . . .
 - D. Have you ever required medicine or treatment for the(se) attack(s)? 1. Yes . . . 2. No . . . 3. Does not apply . . .

BREATHLESSNESS

- 37. If disabled from walking by any condition other than heart or lung disease, please describe and proceed to question 39A. Nature of condition(s)
- 38A. Are you troubled by shortness of breath when hurrying on the level or walking up a slight hill? 1. Yes . . . 2. No . . . IF YES TO 38A:
 - B. Do you have to walk slower than people of your age on the level because of breathlessness? 1. Yes . . . 2. No . . . 3. Does not apply. . .
 - C. Do you ever have to stop for breath when walking at your own pace on the level? 1. Yes . . . 2. No . . . 3. Does not apply . . .
 - D. Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on the level? 1. Yes . . . 2. No . . . 3. Does not apply. . .
 - E. Are you too breathless to leave the house or breathless on dressing or climbing one flight of stairs? 1. Yes . . . 2. No . . . 3. Does not apply. . .

TOBACCO SMOKING

- 39A. Have you ever smoked cigarettes? 1. Yes ... 2. No ...
 (No means less than 20 packs of cigarettes or 12 oz. of tobacco in a lifetime or less than 1 cigarette a day for 1 year.)
 IF YES TO 39A:
- B. Do you now smoke cigarettes 1. Yes ... 2. No ...
 (as of one month ago?) 3. Does not apply ...
- C. How old were you when you first started regular cigarette smoking? Age in years ...
 Does not apply ...
- D. If you have stopped smoking cigarettes completely, how old were you when you stopped? Aged stopped ...
 Check if still smoking ...
 Does not apply ...
- E. How many cigarettes do you smoke per day now? Cigarettes per day ...
 Does not apply ...
- F. On the average of the entire time you smoked, how many cigarettes did you smoke per day? Cigarettes per day ...
 Does not apply ...
- G. Do you or did you inhale the cigarette smoke? 1. Does not apply ...
 2. Not at all ...
 3. Slightly ...
 4. Moderately ...
 5. Deeply ...

- 40A. Have you ever smoked a pipe regularly? (Yes means more than 12 ounces of tobacco in a lifetime.) 1. Yes ... 2. No ...
 IF YES TO 40A:

FOR PERSONS WHO HAVE EVER SMOKED A PIPE

- B. 1. How old were you when you started to smoke a pipe regularly? Age ...
2. If you have stopped smoking a pipe completely, how old were you when you stopped? Age stopped ...
 Check if still smoking pipe ...
 Does not apply ...
- C. On the average over the entire time you smoked a pipe, how much pipe tobacco did you smoke per week? ... oz. per week
 (a standard pouch of tobacco contains 1-1/2 ounces)
 ... Does not apply
- D. How much pipe tobacco are you smoking now? oz. per week ...
 Not currently smoking a pipe ...
- E. Do you or did you inhale the pipe smoke? 1. Never smoked ...
 2. Not at all ...
 3. Slightly ...
 4. Moderately ...
 5. Deeply ...
- 41A. Have you ever smoked cigars regularly? (Yes means more than 1 cigar a week for a year.) 1. Yes ... 2. No ...
 IF YES TO 41A:

FOR PERSONS WHO HAVE EVER SMOKED CIGARS

- B. 1. How old were you when you started smoking cigars regularly? Age ...
2. If you have stopped smoking cigars completely, how old were you when you stopped? Age stopped ...
 Check if still smoking cigars ...
 Does not apply ...
- C. On the average over the entire time you smoked cigars, how many cigars did you smoke per week? Cigars per week ...
 Does not apply ...
- D. How many cigars are you smoking per week now? Cigars per week ...
 Check if not smoking cigars currently ...
- E. Do you or did you inhale the cigar smoke? 1. Never smoked ...
 2. Not at all ...
 3. Slightly ...
 4. Moderately ...
 5. Deeply ...

Signature Date

Part 2
 PERIODIC MEDICAL QUESTIONNAIRE

1. NAME
2. SOCIAL SECURITY #
 1 2 3 4 5 6 7 8 9
3. CLOCK NUMBER
 10 11 12 13 14 15
4. PRESENT OCCUPATION
5. PLANT
6. ADDRESS
 7. (Zip Code)
8. TELEPHONE NUMBER
9. INTERVIEWER
10. DATE
 16 17 18 19 20 21
11. What is your marital status? 1. Single ... 4. Separated/
 2. Married ... Divorced ...
 3. Widowed ...
12. OCCUPATIONAL HISTORY
- 12A. In the past year, did you work full time (30 hours per week or more) for 6 months or more? 1. Yes ... 2. No ...
 IF YES TO 12A:
- 12B. In the past year, did you work in a dusty job? 1. Yes ... 2. No ...
 3. Does not apply ...
- 12C. Was dust exposure: 1. Mild ... 2. Moderate ... 3. Severe ...
- 12D. In the past year, were you exposed to gas or chemical fumes in your work? 1. Yes ... 2. No ...
- 12E. Was exposure: 1. Mild ... 2. Moderate ... 3. Severe ...
- 12F. In the past year, what was your: 1. Job/occupation?
 2. Position/job title?
13. RECENT MEDICAL HISTORY
- 13A. Do you consider yourself to be in good health? Yes ... No ...
 If NO, state reason
- 13B. In the past year, have you developed: Yes No
 Epilepsy? ...
 Rheumatic fever? ...
 Kidney disease? ...
 Bladder disease? ...
 Diabetes? ...
 Jaundice? ...
 Cancer? ...
14. CHEST COLDS AND CHEST ILLNESS
- 14A. If you get a cold, does it usually go to your chest? (Usually means more than 1/2 the time.) 1. Yes ... 2. No ...
 3. Don't get colds ...
- 15A. During the past year, have you had any chest illnesses that have kept you off work, indoors at home, or in bed? 1. Yes ... 2. No ...
 3. Does not apply ...
 IF YES TO 15A:
- 15B. Did you produce phlegm with any of these chest illnesses? 1. Yes ... 2. No ...
 3. Does not apply ...
- 15C. In the past year, how many such illnesses with (increased) phlegm did you have which lasted a week or more? Number of illnesses ...
 No such illnesses ...
16. RESPIRATORY SYSTEM
 In the past year have you had:
- | | | |
|-----------------|-----------|-------------------------------------|
| Asthma | Yes or No | Further Comment on Positive Answers |
| Bronchitis | ... | |
| Hay fever | ... | |
| Other allergies | ... | |
| Pneumonia | Yes or No | Further Comment on Positive Answers |
| Tuberculosis | ... | |
| Chest Surgery | ... | |

Other Lung Problems	...		
Heart disease	...		
Do you have:	Yes or No	Further Comment on Positive Answers	
Frequent colds	...		
Chronic cough	...		
Shortness of breath when walking or climbing one flight of stairs	...		
Do you:			
Wheeze	...		
Cough up phlegm	...		
Smoke cigarettes	...	Packs per day . . .	
		How many years . . .	
Date	Signature		

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07741, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07741, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07741, filed 4/27/87.]

WAC 296-62-07743 Appendix E—Interpretation and classification of chest roentgenograms—Mandatory.

(1) Chest roentgenograms shall be interpreted and classified in accordance with a professionally accepted classification system and recorded on an interpretation form following the format of the CDC/NIOSH (M) 2.8 form. As a minimum, the content within the bold lines of this form (items one through four) shall be included. This form is not to be submitted to NIOSH.

(2) Roentgenograms shall be interpreted and classified only by a B-reader, a board eligible/certified radiologist, or an experienced physician with known expertise in pneumoconioses.

(3) All interpreters, whenever interpreting chest roentgenograms made under this section, shall have immediately available for reference a complete set of the ILO-U/C International Classification of Radiographs for Pneumoconioses, 1980.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-07743, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07743, filed 4/27/87.]

WAC 296-62-07745 Appendix F—Work practices and engineering controls for automotive brake and clutch inspection, disassembly, repair and assembly—Mandatory.

This mandatory appendix specifies engineering controls and work practices that must be implemented by the employer during automotive brake and clutch inspection, disassembly, repair, and assembly operations. Proper use of these engineering controls and work practices will reduce employees' asbestos exposure below the permissible exposure level during clutch and brake inspection, disassembly, repair, and assembly operations. The employer shall institute engineering controls and work practices using either the method set forth in (1) or (2) of this appendix, or any other method which the employer can demonstrate to be equivalent in terms of reducing employee exposure to asbestos as defined and which meets the requirements described in (3) of this appendix, for those facilities in which no more than 5 pairs of brakes or 5 clutches are inspected, disassembled,

reassembled and/or repaired per week, the method set forth in (4) of this appendix may be used:

(1) Negative pressure enclosure/HEPA vacuum system method.

(a) The brake and clutch inspection, disassembly, repair, and assembly operations shall be enclosed to cover and contain the clutch or brake assembly and to prevent the release of asbestos fibers into the worker's breathing zone.

(b) The enclosure shall be sealed tightly and thoroughly inspected for leaks before work begins on brake and clutch inspection, disassembly, repair and assembly.

(c) The enclosure shall be such that the worker can clearly see the operation and shall provide impermeable sleeves through which the worker can handle the brake and clutch inspection, disassembly, repair and assembly. The integrity of the sleeves and ports shall be examined before work begins.

(d) A HEPA-filtered vacuum shall be employed to maintain the enclosure under negative pressure throughout the operation. Compressed-air may be used to remove asbestos fibers or particles from the enclosure.

(e) The HEPA vacuum shall be used first to loosen the asbestos containing residue from the brake and clutch parts and then to evacuate the loosened asbestos containing material from the enclosure and capture the material in the vacuum filter.

(f) The vacuum's filter, when full, shall be first wetted with a fine mist of water, then removed and placed immediately in an impermeable container, labeled according to WAC 296-62-07721(6) and disposed of according to WAC 296-62-07723.

(g) Any spills or releases of asbestos containing waste material from inside of the enclosure or vacuum hose or vacuum filter shall be immediately cleaned up and disposed of according to WAC 296-62-07723.

(2) Low pressure/wet cleaning method.

(a) A catch basin shall be placed under the brake assembly, positioned to avoid splashes and spills.

(b) The reservoir shall contain water containing an organic solvent or wetting agent. The flow of liquid shall be controlled such that the brake assembly is gently flooded to prevent the asbestos-containing brake dust from becoming airborne.

(c) The aqueous solution shall be allowed to flow between the brake drum and brake support before the drum is removed.

(d) After removing the brake drum, the wheel hub and back of the brake assembly shall be thoroughly wetted to suppress dust.

(e) The brake support plate, brake shoes and brake components used to attach the brake shoes shall be thoroughly washed before removing the old shoes.

(f) In systems using filters, the filters, when full, shall be first wetted with a fine mist of water, then removed and placed immediately in an impermeable container, labeled according to WAC 296-62-07721(6) and disposed of according to WAC 296-62-07723.

(g) Any spills of asbestos-containing aqueous solution or any asbestos-containing waste material shall be cleaned up

immediately and disposed of according to WAC 296-62-07723.

(h) The use of dry brushing during low pressure/wet cleaning operations is prohibited.

(3) Equivalent methods. An equivalent method is one which has sufficient written detail so that it can be reproduced and has been demonstrated that the exposures resulting from the equivalent method are equal to or less than the exposure which would result from the use of the method described in subsection (1) of this appendix. For purposes of making this comparison, the employer shall assume that exposures resulting from the use of the method described in subsection (1) of this appendix shall not exceed 0.016 f/cc, as measured by the WISHA reference method and as averaged over at least 18 personal samples.

(4) Wet method.

(a) A spray bottle, hose nozzle, or other implement capable of delivering a fine mist of water or amended water or other delivery system capable of delivering water at low pressure, shall be used to first thoroughly wet the brake and clutch parts. Brake and clutch components shall then be wiped clean with a cloth.

(b) The cloth shall be placed in an impermeable container, labeled according to WAC 296-62-07721(6) and then disposed of according to WAC 296-62-07723, or the cloth shall be laundered in a way to prevent the release of asbestos fibers in excess of 0.1 fiber per cubic centimeter of air.

(c) Any spills of solvent or any asbestos containing waste material shall be cleaned up immediately according to WAC 296-62-07723.

(d) The use of dry brushing during the wet method operations is prohibited.

[Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050, and 49.26.130. 00-06-075, § 296-62-07745, filed 3/1/00, effective 4/10/00. Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 97-01-079, § 296-62-07745, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-07745, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07745, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07745, filed 4/27/87.]

WAC 296-62-07747 Appendix G—Substance technical information for asbestos—Nonmandatory. (1) Substance identification.

(a) Substance: "Asbestos" is the name of a class of magnesium-silicate minerals that occur in fibrous form. Minerals that are included in this group are chrysotile, crocidolite, amosite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos.

(b) Asbestos is used in the manufacture of heat-resistant clothing, automotive brake and clutch linings, and a variety of building materials including floor tiles, roofing felts, ceiling tiles, asbestos-cement pipe and sheet, and fire-resistant drywall. Asbestos is also present in pipe and boiler insulation materials, and in sprayed-on materials located on beams, in crawlspaces, and between walls.

(c) The potential for a product containing asbestos, tremolite, anthophyllite, and actinolite to release breathable fibers depends on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers. The fibrous or fluffy sprayed-on materi-

als used for fireproofing, insulation, or sound proofing are considered to be friable, and they readily release airborne fibers if disturbed. Materials such as vinyl-asbestos floor tile or roofing felts are considered nonfriable and generally do not emit airborne fibers unless subjected to sanding or sawing operations. Asbestos-cement pipe or sheet can emit airborne fibers if the materials are cut or sawed, or if they are broken during demolition operations.

(d) Permissible exposure: Exposure to airborne asbestos fibers may not exceed 0.1 fiber per cubic centimeter of air (0.1 f/cc) averaged over the eight-hour workday (time weighted average), or 1 fiber per cubic centimeter of air (1 f/cc) during any thirty minute period, (excursion limit).

(2) Health hazard data.

(a) Asbestos can cause disabling respiratory disease and various types of cancers if the fibers are inhaled. Inhaling or ingesting fibers from contaminated clothing or skin can also result in these diseases. The symptoms of these diseases generally do not appear for twenty or more years after initial exposure.

(b) Exposure to asbestos has been shown to cause lung cancer, mesothelioma, and cancer of the stomach and colon. Mesothelioma is a rear cancer of the thin membrane lining of the chest and abdomen. Symptoms of mesothelioma include shortness of breath, pain in the walls of the chest, and/or abdominal pain.

(3) Respirators and protective clothing.

(a) Respirators: You are required to wear a respirator when performing tasks that result in asbestos exposure that exceeds 0.1 fiber per cubic centimeter of air (0.1 f/cc) as an eight-hour time weighted average and/or 1.0 fiber per cubic centimeter (1 f/cc) during any thirty minute period (excursion limit). These conditions can occur while your employer is in the process of installing engineering controls to reduce asbestos exposure, or where engineering controls are not feasible to reduce asbestos exposure. Air-purifying respirators equipped with a high-efficiency particulate air (HEPA) filter can be used where airborne asbestos fiber concentrations do not exceed 1 f/cc; otherwise, air-supplied, positive-pressure, full facepiece respirators must be used. Disposable respirators or dust masks are not permitted to be used for asbestos work. For effective protection, respirators must fit your face and head snugly. Your employer is required to conduct fit tests when you are first assigned a respirator and every six months thereafter. Respirators should not be loosened or removed in work situations where their use is required.

(b) Protective clothing: You are required to wear protective clothing in work areas where asbestos fiber concentrations exceed the permissible exposure limits to prevent contamination of the skin. Where protective clothing is required, your employer must provide you with clean garments. Unless you are working on a large asbestos removal or demolition project, your employer must also provide a change room and separate lockers for your street clothes and contaminated work clothes. If you are working on a large asbestos removal or demolition project, and where it is feasible to do so, your employer must provide a clean room, shower, and decontamination room contiguous to the work area. When leaving the work area, you must remove contaminated clothing before proceeding to the shower. If the shower is not adjacent to the

work area, you must vacuum your clothing before proceeding to the change room and shower. To prevent inhaling fibers in contaminated change rooms and showers, leave your respirator on until you leave the shower and enter the clean change room.

(4) Disposal procedures and cleanup.

(a) Wastes that are generated by processes where asbestos is present include:

(i) Empty asbestos shipping containers.

(ii) Process wastes such as cuttings, trimmings, or reject material.

(iii) Housekeeping waste from sweeping or HEPA vacuuming.

(iv) Asbestos fireproofing or insulating material that is removed from buildings.

(v) Building products that contain asbestos removed during building renovation or demolition.

(vi) Contaminated disposable protective clothing.

(b) Empty shipping bags can be flattened under exhaust hoods and packed into airtight containers for disposal. Empty shipping drums are difficult to clean and should be sealed.

(c) Vacuum bags or disposable paper filters should not be cleaned, but should be sprayed with a fine water mist and placed into a labeled waste container.

(d) Process waste and housekeeping waste should be wetted with water or a mixture of water and surfactant prior to packaging in disposable containers.

(e) Material containing asbestos that is removed from buildings must be disposed of in leaktight 6-mil thick plastic bags, plastic-lined cardboard containers, or plastic-lined metal containers. These wastes, which are removed while wet, should be sealed in containers before they dry out to minimize the release of asbestos fibers during handling.

(5) Access to information.

(a) Each year, your employer is required to inform you of the information contained in this standard and appendices for asbestos. In addition, your employer must instruct you in the proper work practices for handling materials containing asbestos and the correct use of protective equipment.

(b) Your employer is required to determine whether you are being exposed to asbestos. You or your representative has the right to observe employee measurements and to record the results obtained. Your employer is required to inform you of your exposure, and, if you are exposed above the permissible limits, he or she is required to inform you of the actions that are being taken to reduce your exposure to within the permissible limits.

(c) Your employer is required to keep records of your exposures and medical examinations. These exposure records must be kept for at least thirty years. Medical records must be kept for the period of your employment plus thirty years.

(d) Your employer is required to release your exposure and medical records to your physician or designated representative upon your written request.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07747, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-62-07747, filed 5/15/89, effective 6/30/89; 87-24-051 (Order 87-24), § 296-62-07747, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-1008 (Order 87-06), § 296-62-07747, filed 4/27/87.]

WAC 296-62-07749 Appendix H—Medical surveillance guidelines for asbestos—Nonmandatory. (1) Route of entry inhalation, ingestion.

(2) Toxicology.

Clinical evidence of the adverse effects associated with exposure to asbestos is present in the form of several well-conducted epidemiological studies of occupationally exposed workers, family contacts of workers, and persons living near asbestos mines. These studies have shown a definite association between exposure to asbestos and an increased incidence of lung cancer, pleural and peritoneal mesothelioma, gastrointestinal cancer, and asbestosis. The latter is a disabling fibrotic lung disease that is caused only by exposure to asbestos. Exposure to asbestos has also been associated with an increased incidence of esophageal, kidney, laryngeal, pharyngeal, and buccal cavity cancers. As with other known chronic occupational diseases, disease associated with asbestos generally appears about twenty years following the first occurrence of exposure: There are no known acute effects associated with exposure to asbestos.

Epidemiological studies indicate that the risk of lung cancer among exposed workers who smoke cigarettes is greatly increased over the risk of lung cancer among nonexposed smokers or exposed nonsmokers. These studies suggest that cessation of smoking will reduce the risk of lung cancer for a person exposed to asbestos but will not reduce it to the same level of risk as that existing for an exposed worker who has never smoked.

(3) Signs and symptoms of exposure-related disease.

The signs and symptoms of lung cancer or gastrointestinal cancer induced by exposure to asbestos are not unique, except that a chest x-ray of an exposed patient with lung cancer may show pleural plaques, pleural calcification, or pleural fibrosis. Symptoms characteristic of mesothelioma include shortness of breath, pain in the walls of the chest, or abdominal pain. Mesothelioma has a much longer latency period compared with lung cancer (forty years versus fifteen to twenty years), and mesothelioma is therefore more likely to be found among workers who were first exposed to asbestos at an early age. Mesothelioma is always fatal.

Asbestosis is pulmonary fibrosis caused by the accumulation of asbestos fibers in the lungs. Symptoms include shortness of breath, coughing, fatigue, and vague feelings of sickness. When the fibrosis worsens, shortness of breath occurs even at rest. The diagnosis of asbestosis is based on a history of exposure to asbestos, the presence of characteristic radiologic changes, endinspiratory crackles (rales), and other clinical features of fibrosing lung disease. Pleural plaques and thickening are observed on x-rays taken during the early stages of the disease. Asbestosis is often a progressive disease even in the absence of continued exposure, although this appears to be a highly individualized characteristic. In severe cases, death may be caused by respiratory or cardiac failure.

(4) Surveillance and preventive considerations.

As noted above, exposure to asbestos has been linked to an increased risk of lung cancer, mesothelioma, gastrointestinal cancer, and asbestosis among occupationally exposed workers. Adequate screening tests to determine an employee's potential for developing serious chronic diseases, such as cancer, from exposure to asbestos do not presently

exist. However, some tests, particularly chest x-rays and pulmonary function tests, may indicate that an employee has been overexposed to asbestos increasing his or her risk of developing exposure-related chronic diseases. It is important for the physician to become familiar with the operating conditions in which occupational exposure to asbestos is likely to occur. This is particularly important in evaluating medical and work histories and in conducting physical examinations. When an active employee has been identified as having been overexposed to asbestos measures taken by the employer to eliminate or mitigate further exposure should also lower the risk of serious long-term consequences.

The employer is required to institute a medical surveillance program for all employees who are or will be exposed to asbestos at or above the permissible exposure limits (0.1 fiber per cubic centimeter of air) for 30 or more days per year and for all employees who are assigned to wear a negative pressure respirator. All examinations and procedures must be performed by or under the supervision of a licensed physician, at a reasonable time and place, and at no cost to the employee.

Although broad latitude is given to the physician in prescribing specific tests to be included in the medical surveillance program, WISHA requires inclusion of the following elements in the routine examination:

(a) Medical and work histories with special emphasis directed to symptoms of the respiratory system, cardiovascular system, and digestive tract.

(b) Completion of the respiratory disease questionnaire contained in WAC 296-62-07741, Appendix D.

(c) A physical examination including a chest roentgenogram and pulmonary function test that includes measurement of the employee's forced vital capacity (FVC) and forced expiratory volume at one second (FEV₁).

(d) Any laboratory or other test that the examining physician deems by sound medical practice to be necessary.

The employer is required to make the prescribed tests available at least annually to those employees covered; more often than specified if recommended by the examining physician; and upon termination of employment.

The employer is required to provide the physician with the following information: A copy of this standard and appendices; a description of the employee's duties as they relate to asbestos exposure; the employee's representative level of exposure to asbestos; a description of any personal protective and respiratory equipment used; and information from previous medical examinations of the affected employee that is not otherwise available to the physician. Making this information available to the physician will aid in the evaluation of the employee's health in relation to assigned duties and fitness to wear personal protective equipment, if required.

The employer is required to obtain a written opinion from the examining physician containing the results of the medical examination; the physician's opinion as to whether the employee has any detected medical conditions that would place the employee at an increased risk of exposure-related disease; any recommended limitations on the employee or on the use of personal protective equipment; and a statement that the employee has been informed by the physician of the

results of the medical examination and of any medical conditions related to asbestos exposure that require further explanation or treatment. This written opinion must not reveal specific findings or diagnoses unrelated to exposure to asbestos and a copy of the opinion must be provided to the affected employee.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07749, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07749, filed 7/20/94, effective 9/20/94; 87-24-051 (Order 87-24), § 296-62-07749, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-62-07749, filed 4/27/87.]

WAC 296-62-07751 Appendix I—Work practices and engineering controls for Class I asbestos operations—Nonmandatory. This is a nonmandatory appendix to the asbestos standards for construction and for shipyards. It describes criteria and procedures for erecting and using negative pressure enclosures for Class I Asbestos Work, when NPEs are used as an allowable control method to comply with WAC 296-62-07712 (7)(a). Many small and variable details are involved in the erection of a negative pressure enclosure. OSHA and most participants in the rulemaking agreed that only the major, more performance oriented criteria should be made mandatory. These criteria are set out in WAC 296-62-07712. In addition, this appendix includes these mandatory specifications and procedures in its guidelines in order to make this appendix coherent and helpful. The mandatory nature of the criteria which appear in the regulatory text is not changed because they are included in this "nonmandatory" appendix. Similarly, the additional criteria and procedures included as guidelines in the appendix, do not become mandatory because mandatory criteria are also included in these comprehensive guidelines.

In addition, none of the criteria, both mandatory and recommended, are meant to specify or imply the need for use of patented or licensed methods or equipment. Recommended specifications included in this attachment should not discourage the use of creative alternatives which can be shown to reliably achieve the objectives of negative-pressure enclosures.

Requirements included in this appendix, cover general provisions to be followed in all asbestos jobs, provisions which must be followed for all Class I asbestos jobs, and provisions governing the construction and testing of negative pressure enclosures. The first category includes the requirement for use of wet methods, HEPA vacuums, and immediate bagging of waste; Class I work must conform to the following provisions:

- oversight by competent person
- use of critical barriers over all openings to work area
- isolation of HVAC systems
- use of impermeable dropcloths and coverage of all objects within regulated areas

In addition, more specific requirements for NPEs include:

- maintenance of -0.02 inches water gauge within enclosure
- manometric measurements

- air movement away from employees performing removal work
- smoke testing or equivalent for detection of leaks and air direction
- deactivation of electrical circuits, if not provided with ground-fault circuit interrupters.

Planning the Project

The standard requires that an exposure assessment be conducted before the asbestos job is begun WAC 296-62-07709(3). Information needed for that assessment, includes data relating to prior similar jobs, as applied to the specific variables of the current job. The information needed to conduct the assessment will be useful in planning the project, and in complying with any reporting requirements under this standard, when significant changes are being made to a control system listed in the standard, (see WAC 296-62-07719), as well as those of USEPA (40 CFR Part 61, subpart M). Thus, although the standard does not explicitly require the preparation of a written asbestos removal plan, the usual constituents of such a plan, i.e., a description of the enclosure, the equipment, and the procedures to be used throughout the project, must be determined before the enclosure can be erected. The following information should be included in the planning of the system:

A physical description of the work area;

A description of the approximate amount of material to be removed;

A schedule for turning off and sealing existing ventilation systems;

Personnel hygiene procedures;

A description of personal protective equipment and clothing to be worn by employees;

A description of the local exhaust ventilation systems to be used and how they are to be tested;

A description of work practices to be observed by employees;

An air monitoring plan;

A description of the method to be used to transport waste material; and

The location of the dump site.

Materials and Equipment Necessary for Asbestos Removal

Although individual asbestos removal projects vary in terms of the equipment required to accomplish the removal of the materials, some equipment and materials are common to most asbestos removal operations.

Plastic sheeting used to protect horizontal surfaces, seal HVAC openings or to seal vertical openings and ceilings should have a minimum thickness of 6 mils. Tape or other adhesive used to attach plastic sheeting should be of sufficient adhesive strength to support the weight of the material plus all stresses encountered during the entire duration of the project without becoming detached from the surface.

Other equipment and materials which should be available at the beginning of each project are:

- HEPA Filtered Vacuum is essential for cleaning the work area after the asbestos has been removed. It should have a long hose capable of reaching out-of-the-way places, such as areas above ceiling tiles, behind pipes, etc.
- Portable air ventilation systems installed to provide the negative air pressure and air removal from the enclosure must be equipped with a HEPA filter. The number and capacity of units required to ventilate an enclosure depend on the size of the area to be ventilated. The filters for these systems should be designed in such a manner that they can be replaced when the air flow volume is reduced by the build-up of dust in the filtration material. Pressure monitoring devices with alarms and strip chart recorders attached to each system to indicate the pressure differential and the loss due to dust buildup on the filter are recommended.
- Water sprayers should be used to keep the asbestos material as saturated as possible during removal; the sprayers will provide a fine mist that minimizes the impact of the spray on the material.
- Water used to saturate the asbestos containing material can be amended by adding at least 15 milliliters (½ ounce) of wetting agent in 1 liter (1 pint) of water. An example of a wetting agent is a 50/50 mixture of polyoxyethylene ether and polyoxyethylene polyglycol ester.
- Backup power supplies are recommended, especially for ventilation systems.
- Shower and bath water should be with mixed hot and cold water faucets. Water that has been used to clean personnel or equipment should either be filtered or be collected and discarded as asbestos waste. Soap and shampoo should be provided to aid in removing dust from the workers' skin and hair.
- See WAC 296-62-07715 and 296-62-07717 for appropriate respiratory protection and protective clothing.
- See WAC 296-62-07721 for required signs and labels.

Preparing the Work Area

Disabling HVAC Systems: The power to the heating, ventilation, and air conditioning systems that service the restricted area must be deactivated and locked off. All ducts, grills, access ports, windows and vents must be sealed off with two layers of plastic to prevent entrainment of contaminated air.

Operating HVAC Systems in the Restricted Area: If components of a HVAC system located in the restricted area are connected to a system that will service another zone during the project, the portion of the duct in the restricted area must be sealed and pressurized. Necessary precautions include caulking the duct joints, covering all cracks and openings with two layers of sheeting, and pressurizing the duct throughout the duration of the project by restricting the return air flow. The power to the fan supplying the positive pressure should be locked "on" to prevent pressure loss.

Sealing Elevators: If an elevator shaft is located in the restricted area, it should be either shut down or isolated by

sealing with two layers of plastic sheeting. The sheeting should provide enough slack to accommodate the pressure changes in the shaft without breaking the air-tight seal.

Removing Mobile Objects: All movable objects should be cleaned and removed from the work area before an enclosure is constructed unless moving the objects creates a hazard. Mobile objects will be assumed to be contaminated and should be either cleaned with amended water and a HEPA vacuum and then removed from the area or wrapped and then disposed of as hazardous waste.

Cleaning and Sealing Surfaces: After cleaning with water and a HEPA vacuum, surfaces of stationary objects should be covered with two layers of plastic sheeting. The sheeting should be secured with duct tape or an equivalent method to provide a tight seal around the object.

Bagging Waste: In addition to the requirement for immediate bagging of waste for disposal, it is further recommended that the waste material be double-bagged and sealed in plastic bags designed for asbestos disposal. The bags should be stored in a waste storage area that can be controlled by the workers conducting the removal. Filters removed from air handling units and rubbish removed from the area are to be bagged and handled as hazardous waste.

Constructing the Enclosure

The enclosure should be constructed to provide an air-tight seal around ducts and openings into existing ventilation systems and around penetrations for electrical conduits, telephone wires, water lines, drain pipes, etc. Enclosures should be both airtight and watertight except for those openings designed to provide entry and/or air flow control.

Size: An enclosure should be the minimum volume to encompass all of the working surfaces yet allow unencumbered movement by the worker(s), provide unrestricted air flow past the worker(s), and ensure walking surfaces can be kept free of tripping hazards.

Shape: The enclosure may be any shape that optimizes the flow of ventilation air past the worker(s).

Structural Integrity: The walls, ceilings and floors must be supported in such a manner that portions of the enclosure will not fall down during normal use.

Openings: It is not necessary that the structure be air-tight; openings may be designed to direct air flow. Such openings should be located at a distance from active removal operations. They should be designed to draw air into the enclosure under all anticipated circumstances. In the event that negative pressure is lost, they should be fitted with either HEPA filters to trap dust or automatic trap doors that prevent dust from escaping the enclosure. Openings for exits should be controlled by an airlock or a vestibule.

Barrier Supports: Frames should be constructed to support all unsupported spans of sheeting.

Sheeting: Walls, barriers, ceilings, and floors should be lined with two layers of plastic sheeting having a thickness of at least 6 mil.

Seams: Seams in the sheeting material should be minimized to reduce the possibilities of accidental rips and tears in the adhesive or connections. All seams in the sheeting should overlap, be staggered and not be located at corners or wall-to-floor joints.

Areas Within an Enclosure: Each enclosure consists of a work area, a decontamination area, and waste storage area. The work area where the asbestos removal operations occur should be separated from both the waste storage area and the contamination control area by physical curtains, doors, and/or airflow patterns that force any airborne contamination back into the work area.

See WAC 296-62-07719 for requirements for hygiene facilities.

During egress from the work area, each worker should step into the equipment room, clean tools and equipment, and remove gross contamination from clothing by wet cleaning and HEPA vacuuming. Before entering the shower area, foot coverings, head coverings, hand coverings, and coveralls are removed and placed in impervious bags for disposal or cleaning. Airline connections from airline respirators with HEPA disconnects and power cables from powered air-purifying respirators (PAPRs) will be disconnected just prior to entering the shower room.

Establishing Negative Pressure Within the Enclosure

Negative Pressure: Air is to be drawn into the enclosure under all anticipated conditions and exhausted through a HEPA filter for 24 hours a day during the entire duration of the project.

Air Flow Tests: Air flow patterns will be checked before removal operations begin, at least once per operating shift and any time there is a question regarding the integrity of the enclosure. The primary test for air flow is to trace air currents with smoke tubes or other visual methods. Flow checks are made at each opening and at each doorway to demonstrate that air is being drawn into the enclosure and at each worker's position to show that air is being drawn away from the breathing zone.

Monitoring Pressure Within the Enclosure: After the initial air flow patterns have been checked, the static pressure must be monitored within the enclosure. Monitoring may be made using manometers, pressure gauges, or combinations of these devices. It is recommended that they be attached to alarms and strip chart recorders at points identified by the design engineer.

Corrective Actions: If the manometers or pressure gauges demonstrate a reduction in pressure differential below the required level, work should cease and the reason for the change investigated and appropriate changes made. The air flow patterns should be retested before work begins again.

Pressure Differential: The design parameters for static pressure differentials between the inside and outside of enclosures typically range from 0.02 to 0.10 inches of water gauge, depending on conditions. All zones inside the enclosure must have less pressure than the ambient pressure outside of the enclosure (-0.02 inches water gauge differential). Design specifications for the differential vary according to the size, configuration, and shape of the enclosure as well as ambient and mechanical air pressure conditions around the enclosure.

Air Flow Patterns: The flow of air past each worker shall be enhanced by positioning the intakes and exhaust ports to remove contaminated air from the worker's breathing zone, by positioning HEPA vacuum cleaners to draw air from the worker's breathing zone, by forcing relatively uncontami-

nated air past the worker toward an exhaust port, or by using a combination of methods to reduce the worker's exposure.

Air Handling Unit Exhaust: The exhaust plume from air handling units should be located away from adjacent personnel and intakes for HVAC systems.

Air Flow Volume: The air flow volume (cubic meters per minute) exhausted (removed) from the workplace must exceed the amount of makeup air supplied to the enclosure. The rate of air exhausted from the enclosure should be designed to maintain a negative pressure in the enclosure and air movement past each worker. The volume of air flow removed from the enclosure should replace the volume of the container at every 5 to 15 minutes. Air flow volume will need to be relatively high for large enclosures, enclosures with awkward shapes, enclosures with multiple openings, and operations employing several workers in the enclosure.

Air Flow Velocity: At each opening, the air flow velocity must visibly "drag" air into the enclosure. The velocity of air flow within the enclosure must be adequate to remove airborne contamination from each worker's breathing zone without disturbing the asbestos-containing material on surfaces.

Airlocks: Airlocks are mechanisms on doors and curtains that control the air flow patterns in the doorways. If air flow occurs, the patterns through doorways must be such that the air flows toward the inside of the enclosure. Sometimes vestibules, double doors, or double curtains are used to prevent air movement through the doorways. To use a vestibule, a worker enters a chamber by opening the door or curtain and then closing the entry before opening the exit door or curtain.

Airlocks should be located between the equipment room and shower room, between the shower room and the clean room, and between the waste storage area and the outside of the enclosure. The air flow between adjacent rooms must be checked using smoke tubes or other visual tests to ensure the flow patterns draw air toward the work area without producing eddies.

Monitoring for Airborne Concentrations

In addition to the breathing zone samples taken as outlined in WAC 296-62-07709, samples of air should be taken to demonstrate the integrity of the enclosure, the cleanliness of the clean room and shower area, and the effectiveness of the HEPA filter. If the clean room is shown to be contaminated, the room must be relocated to an uncontaminated area.

Samples taken near the exhaust of portable ventilation systems must be done with care.

General Work Practices

Preventing dust dispersion is the primary means of controlling the spread of asbestos within the enclosure. Whenever practical, the point of removal should be isolated, enclosed, covered, or shielded from the workers in the area. Waste asbestos containing materials must be bagged during or immediately after removal; the material must remain saturated until the waste container is sealed.

Waste material with sharp points or corners must be placed in hard air-tight containers rather than bags.

Whenever possible, large components should be sealed in plastic sheeting and removed intact.

Bags or containers of waste will be moved to the waste holding area, washed, and wrapped in a bag with the appropriate labels.

Cleaning the Work Area

Surfaces within the work area should be kept free of visible dust and debris to the extent feasible. Whenever visible dust appears on surfaces, the surfaces within the enclosure must be cleaned by wiping with a wet sponge, brush, or cloth and then vacuumed with a HEPA vacuum.

All surfaces within the enclosure should be cleaned before the exhaust ventilation system is deactivated and the enclosure is disassembled. An approved encapsulant may be sprayed onto areas after the visible dust has been removed.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-62-07751, filed 12/17/96, effective 3/1/97. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-07751, filed 7/20/94, effective 9/20/94; 87-24-051 (Order 87-24), § 296-62-07751, filed 11/30/87.]

WAC 296-62-07753 Appendix J—Polarized light microscopy of asbestos—Nonmandatory. Method number: ID-191

Matrix: Bulk

Collection Procedure

Collect approximately 1 to 2 grams of each type of material and place into separate 20 mL scintillation vials.

Analytical Procedure

A portion of each separate phase is analyzed by gross examination, phase-polar examination, and central stop dispersion microscopy.

Commercial manufacturers and products mentioned in this method are for descriptive use only and do not constitute endorsements by USDOL-WISHA. Similar products from other sources may be substituted.

(1) Introduction

This method describes the collection and analysis of asbestos bulk materials by light microscopy techniques including phase-polar illumination and central-stop dispersion microscopy. Some terms unique to asbestos analysis are defined below:

Amphibole: A family of minerals whose crystals are formed by long, thin units which have two thin ribbons of double chain silicate with a brucite ribbon in between. The shape of each unit is similar to an "I beam." Minerals important in asbestos analysis include cummingtonite-grunerite, crocidolite, tremolite-actinolite and anthophyllite.

Asbestos: A term for naturally occurring fibrous minerals. Asbestos includes chrysotile, cummingtonite-grunerite asbestos (amosite), anthophyllite asbestos, tremolite asbestos, crocidolite, actinolite asbestos and any of these minerals which have been chemically treated or altered. The precise chemical formulation of each species varies with the location from which it was mined. Nominal compositions are listed:

Chrysotile $Mg_3Si_2O_5(OH)_4$

Crocidolite (Riebeckite

asbestos) $Na_2Fe_32+Fe_23+Si_8O_{22}(OH)_2$

Cummingtonite-Grunerite

asbestos (Amosite) $(Mg,Fe)_7Si_8O_{22}(OH)_2$

Tremolite-Actinolite asbestos $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$

Anthophyllite asbestos ($\text{Mg,Fe}_7\text{Si}_8\text{O}_{22}(\text{HO})_2$)

Asbestos Fiber: A fiber of asbestos meeting the criteria for a fiber. (See section (3)(e))

Aspect Ratio: The ratio of the length of a fiber to its diameter usually defined as "length: width", e.g. 3:1.

Brucite: A sheet mineral with the composition $\text{mg}(\text{OH})_2$.

Central Stop Dispersion Staining (microscope): This is a dark field microscope technique that images particles using only light refracted by the particle, excluding light that travels through the particle unrefracted. This is usually accomplished with a McCrone objective or other arrangement which places a circular stop with apparent aperture equal to the objective aperture in the back focal plane of the microscope.

Cleavage Fragments: Mineral particles formed by the comminution of minerals, especially those characterized by relatively parallel sides and moderate aspect ratio.

Differential Counting: The term applied to the practice of excluding certain kinds of fibers from a phase contrast asbestos count because they are not asbestos.

Fiber: A particle longer than or equal to 5 microns with a length to width ratio greater than or equal to 3:1. This may include cleavage fragments. (See section (3)(e) of this appendix).

Phase Contrast: Contrast obtained in the microscope by causing light scattered by small particles to destructively interfere with unscattered light, thereby enhancing the visibility of very small particles and particles with very low intrinsic contrast.

Phase Contrast Microscope: A microscope configured with a phase mask pair to create phase contrast. The technique which uses this is called Phase Contrast Microscopy (PCM).

Phase-Polar Analysis: This is the use of polarized light in a phase contrast microscope. It is used to see the same size fibers that are visible in air filter analysis. Although fibers finer than 1 micron are visible, analysis of these is inferred from analysis of larger bundles that are usually present.

Phase-Polar Microscope: The phase-polar microscope is a phase contrast microscope which has an analyzer, a polarizer, a first order red plate and a rotating phase condenser all in place so that the polarized light image is enhanced by phase contrast.

Sealing Encapsulant: This is a product which can be applied, preferably by spraying, onto an asbestos surface which will seal the surface so that fibers cannot be released.

Serpentine: A mineral family consisting of minerals with the general composition $\text{Mg}_3(\text{Si}_2\text{O}_5(\text{OH})_4$ having the magnesium in brucite layer over a silicate layer. Minerals important in asbestos analysis included in this family are chrysotile, lizardite, antigorite.

(a) History

Light microscopy has been used for well over 100 years for the determination of mineral species. This analysis is carried out using specialized polarizing microscopes as well as bright field microscopes. The identification of minerals is an on-going process with many new minerals described each

(2001 Ed.)

year. The first recorded use of asbestos was in Finland about 2500 B.C. where the material was used in the mud wattle for the wooden huts the people lived in as well as strengthening for pottery. Adverse health aspects of the mineral were noted nearly 2000 years ago when Pliny the Younger wrote about the poor health of slaves in the asbestos mines. Although known to be injurious for centuries, the first modern references to its toxicity were by the British Labor Inspectorate when it banned asbestos dust from the workplace in 1898. Asbestosis cases were described in the literature after the turn of the century. Cancer was first suspected in the mid 1930's and a causal link to mesothelioma was made in 1965. Because of the public concern for worker and public safety with the use of this material, several different types of analysis were applied to the determination of asbestos content. Light microscopy requires a great deal of experience and craft. Attempts were made to apply less subjective methods to the analysis. X-ray diffraction was partially successful in determining the mineral types but was unable to separate out the fibrous portions from the nonfibrous portions. Also, the minimum detection limit for asbestos analysis by X-ray diffraction (XRD) is about 1%. Differential Thermal Analysis (DTA) was no more successful. These provide useful corroborating information when the presence of asbestos has been shown by microscopy; however, neither can determine the difference between fibrous and nonfibrous minerals when both habits are present. The same is true of Infrared Absorption (IR).

When electron microscopy was applied to asbestos analysis, hundreds of fibers were discovered present too small to be visible in any light microscope. There are two different types of electron microscopes used for asbestos analysis: Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Scanning Electron Microscopy is useful in identifying minerals. The SEM can provide two of the three pieces of information required to identify fibers by electron microscopy: Morphology and chemistry. The third is structure as determined by Selected Area Electron Diffraction-SAED which is performed in the TEM. Although the resolution of the SEM is sufficient for very fine fibers to be seen, accuracy of chemical analysis that can be performed on the fibers varies with fiber diameter in fibers of less than 0.2 micron diameter. The TEM is a powerful tool to identify fibers too small to be resolved by light microscopy and should be used in conjunction with this method when necessary. The TEM can provide all three pieces of information required for fiber identification. Most fibers thicker than 1 micron can adequately be defined in the light microscope. The light microscope remains as the best instrument for the determination of mineral type. This is because the minerals under investigation were first described analytically with the light microscope. It is inexpensive and gives positive identification for most samples analyzed. Further, when optical techniques are inadequate, there is ample indication that alternative techniques should be used for complete identification of the sample.

(b) Principle

Minerals consist of atoms that may be arranged in random order or in a regular arrangement. Amorphous materials have atoms in random order while crystalline materials have

long range order. Many materials are transparent to light, at least for small particles or for thin sections. The properties of these materials can be investigated by the effect that the material has on light passing through it. The six asbestos minerals are all crystalline with particular properties that have been identified and cataloged. These six minerals are anisotropic. They have a regular array of atoms, but the arrangement is not the same in all directions. Each major direction of the crystal presents a different regularity. Light photons travelling in each of these main directions will encounter different electrical neighborhoods, affecting the path and time of travel. The techniques outlined in this method use the fact that light traveling through fibers or crystals in different directions will behave differently, but predictably. The behavior of the light as it travels through a crystal can be measured and compared with known or determined values to identify the mineral species. Usually, Polarized Light Microscopy (PLM) is performed with strain-free objectives on a bright-field microscope platform. This would limit the resolution of the microscope to about 0.4 micron. Because WISHA requires the counting and identification of fibers visible in phase contrast, the phase contrast platform is used to visualize the fibers with the polarizing elements added into the light path. Polarized light methods cannot identify fibers finer than about 1 micron in diameter even though they are visible. The finest fibers are usually identified by inference from the presence of larger, identifiable fiber bundles. When fibers are present, but not identifiable by light microscopy, use either SEM or TEM to determine the fiber identity.

(c) Advantages and Disadvantages

The advantages of light microscopy are:

(i) Basic identification of the materials was first performed by light microscopy and gross analysis. This provides a large base of published information against which to check analysis and analytical technique.

(ii) The analysis is specific to fibers. The minerals present can exist in asbestiform, fibrous, prismatic, or massive varieties all at the same time. Therefore, bulk methods of analysis such as X-ray diffraction, IR analysis, DTA, etc. are inappropriate where the material is not known to be fibrous.

(iii) The analysis is quick, requires little preparation time, and can be performed on-site if a suitably equipped microscope is available.

The disadvantages are:

(iv) Even using phase-polar illumination, not all the fibers present may be seen. This is a problem for very low asbestos concentrations where agglomerations or large bundles of fibers may not be present to allow identification by inference.

(v) The method requires a great degree of sophistication on the part of the microscopist. An analyst is only as useful as his mental catalog of images. Therefore, a microscopist's accuracy is enhanced by experience. The mineralogical training of the analyst is very important. It is the basis on which subjective decisions are made.

(vi) The method uses only a tiny amount of material for analysis. This may lead to sampling bias and false results (high or low). This is especially true if the sample is severely inhomogeneous.

(vii) Fibers may be bound in a matrix and not distinguishable as fibers so identification cannot be made.

(d) Method Performance

(i) This method can be used for determination of asbestos content from 0 to 100% asbestos. The detection limit has not been adequately determined, although for selected samples, the limit is very low, depending on the number of particles examined. For mostly homogeneous, finely divided samples, with no difficult fibrous interferences, the detection limit is below 1%. For inhomogeneous samples (most samples), the detection limit remains undefined. NIST has conducted proficiency testing of laboratories on a national scale. Although each round is reported statistically with an average, control limits, etc., the results indicate a difficulty in establishing precision especially in the low concentration range. It is suspected that there is significant bias in the low range especially near 1%. EPA tried to remedy this by requiring a mandatory point counting scheme for samples less than 10%. The point counting procedure is tedious, and may introduce significant biases of its own. It has not been incorporated into this method.

(ii) The precision and accuracy of the quantitation tests performed in this method are unknown. Concentrations are easier to determine in commercial products where asbestos was deliberately added because the amount is usually more than a few percent. An analyst's results can be "calibrated" against the known amounts added by the manufacturer. For geological samples, the degree of homogeneity affects the precision.

(iii) The performance of the method is analyst dependent. The analyst must choose carefully and not necessarily randomly the portions for analysis to assure that detection of asbestos occurs when it is present. For this reason, the analyst must have adequate training in sample preparation, and experience in the location and identification of asbestos in samples. This is usually accomplished through substantial on-the-job training as well as formal education in mineralogy and microscopy.

(e) Interferences

Any material which is long, thin, and small enough to be viewed under the microscope can be considered an interference for asbestos. There are literally hundreds of interferences in workplaces. The techniques described in this method are normally sufficient to eliminate the interferences. An analyst's success in eliminating the interferences depends on proper training.

Asbestos minerals belong to two mineral families: The serpentines and the amphiboles. In the serpentine family, the only common fibrous mineral is chrysotile. Occasionally, the mineral antigorite occurs in a fibril habit with morphology similar to the amphiboles. The amphibole minerals consist of a score of different minerals of which only five are regulated by federal standard: Amosite, crocidolite, anthophyllite asbestos, tremolite asbestos and actinolite asbestos. These are the only amphibole minerals that have been commercially exploited for their fibrous properties; however, the rest can and do occur occasionally in asbestiform habit.

In addition to the related mineral interferences, other minerals common in building material may present a problem for some microscopists: Gypsum, anhydrite, brucite, quartz

fibers, talc fibers or ribbons, wollastonite, perlite, attapulgite, etc. Other fibrous materials commonly present in workplaces are: Fiberglass, mineral wool, ceramic wool, refractory ceramic fibers, kevlar, nomex, synthetic fibers, graphite or carbon fibers, cellulose (paper or wood) fibers, metal fibers, etc.

Matrix embedding material can sometimes be a negative interference. The analyst may not be able to easily extract the fibers from the matrix in order to use the method. Where possible, remove the matrix before the analysis, taking careful note of the loss of weight. Some common matrix materials are: Vinyl, rubber, tar, paint, plant fiber, cement, and epoxy. A further negative interference is that the asbestos fibers themselves may be either too small to be seen in Phase Contrast Microscopy (PCM) or of a very low fibrous quality, having the appearance of plant fibers. The analyst's ability to deal with these materials increases with experience.

(f) Uses and Occupational Exposure

Asbestos is ubiquitous in the environment. More than 40% of the land area of the United States is composed of minerals which may contain asbestos. Fortunately, the actual formation of great amounts of asbestos is relatively rare. Nonetheless, there are locations in which environmental exposure can be severe such as in the Serpentine Hills of California.

There are thousands of uses for asbestos in industry and the home. Asbestos abatement workers are the most current segment of the population to have occupational exposure to great amounts of asbestos. If the material is undisturbed, there is no exposure. Exposure occurs when the asbestos-containing material is abraded or otherwise disturbed during maintenance operations or some other activity. Approximately 95% of the asbestos in place in the United States is chrysotile.

Amosite and crocidolite make up nearly all the difference. Tremolite and anthophyllite make up a very small percentage. Tremolite is found in extremely small amounts in certain chrysotile deposits. Actinolite exposure is probably greatest from environmental sources, but has been identified in vermiculite containing, sprayed-on insulating materials which may have been certified as asbestos-free.

(g) Physical and Chemical Properties

The nominal chemical compositions for the asbestos minerals were given in subsection (1). Compared to cleavage fragments of the same minerals, asbestiform fibers possess a high tensile strength along the fiber axis. They are chemically inert, noncombustible, and heat resistant. Except for chrysotile, they are insoluble in Hydrochloric acid (HCl). Chrysotile is slightly soluble in HCl. Asbestos has high electrical resistance and good sound absorbing characteristics. It can be woven into cables, fabrics or other textiles, or matted into papers, felts, and mats.

(h) Toxicology (This Section is for Information Only and Should Not Be Taken as WISHA Policy)

Possible physiologic results of respiratory exposure to asbestos are mesothelioma of the pleura or peritoneum, interstitial fibrosis, asbestosis, pneumoconiosis, or respiratory cancer. The possible consequences of asbestos exposure are detailed in the NIOSH Criteria Document or in the WISHA Asbestos Standards, WAC 296-62-077.

(2) Sampling Procedure

(a) Equipment for Sampling

- (i) Tube or cork borer sampling device
- (ii) Knife
- (iii) 20 mL scintillation vial or similar vial
- (iv) Sealing encapsulant

(b) Safety Precautions

Asbestos is a known carcinogen. Take care when sampling. While in an asbestos-containing atmosphere, a properly selected and fit-tested respirator should be worn. Take samples in a manner to cause the least amount of dust. Follow these general guidelines:

- (i) Do not make unnecessary dust.
- (ii) Take only a small amount (1 to 2 g).
- (iii) Tightly close the sample container.
- (iv) Use encapsulant to seal the spot where the sample was taken, if necessary.

(c) Sampling procedure

Samples of any suspect material should be taken from an inconspicuous place. Where the material is to remain, seal the sampling wound with an encapsulant to eliminate the potential for exposure from the sample site. Microscopy requires only a few milligrams of material. The amount that will fill a 20 mL scintillation vial is more than adequate. Be sure to collect samples from all layers and phases of material. If possible, make separate samples of each different phase of the material. This will aid in determining the actual hazard. DO NOT USE ENVELOPES, PLASTIC OR PAPER BAGS OF ANY KIND TO COLLECT SAMPLES. The use of plastic bags presents a contamination hazard to laboratory personnel and to other samples. When these containers are opened, a bellows effect blows fibers out of the container onto everything, including the person opening the container.

If a cork-borer type sampler is available, push the tube through the material all the way, so that all layers of material are sampled. Some samplers are intended to be disposable. These should be capped and sent to the laboratory. If a non-disposable cork borer is used, empty the contents into a scintillation vial and send to the laboratory. Vigorously and completely clean the cork borer between samples.

(d) Shipment

Samples packed in glass vials must not touch or they might break in shipment.

(i) Seal the samples with a sample seal over the end to guard against tampering and to identify the sample.

(ii) Package the bulk samples in separate packages from the air samples. They may cross-contaminate each other and will invalidate the results of the air samples.

(iii) Include identifying paperwork with the samples, but not in contact with the suspected asbestos.

(iv) To maintain sample accountability, ship the samples by certified mail, overnight express, or hand carry them to the laboratory.

(3) Analysis

The analysis of asbestos samples can be divided into two major parts: Sample preparation and microscopy. Because of the different asbestos uses that may be encountered by the analyst, each sample may need different preparation steps. The choices are outlined below. There are several different tests that are performed to identify the asbestos species and determine the percentage. They will be explained below.

(a) Safety

(i) Do not create unnecessary dust. Handle the samples in HEPA-filter equipped hoods. If samples are received in bags, envelopes or other inappropriate container, open them only in a hood having a face velocity at or greater than 100 fpm. Transfer a small amount to a scintillation vial and only handle the smaller amount.

(ii) Open samples in a hood, never in the open lab area.

(iii) Index of refraction oils can be toxic. Take care not to get this material on the skin. Wash immediately with soap and water if this happens.

(iv) Samples that have been heated in the muffle furnace or the drying oven may be hot. Handle them with tongs until they are cool enough to handle.

(v) Some of the solvents used, such as THF (tetrahydrofuran), are toxic and should only be handled in an appropriate fume hood and according to instructions given in the Material Safety Data Sheet (MSDS).

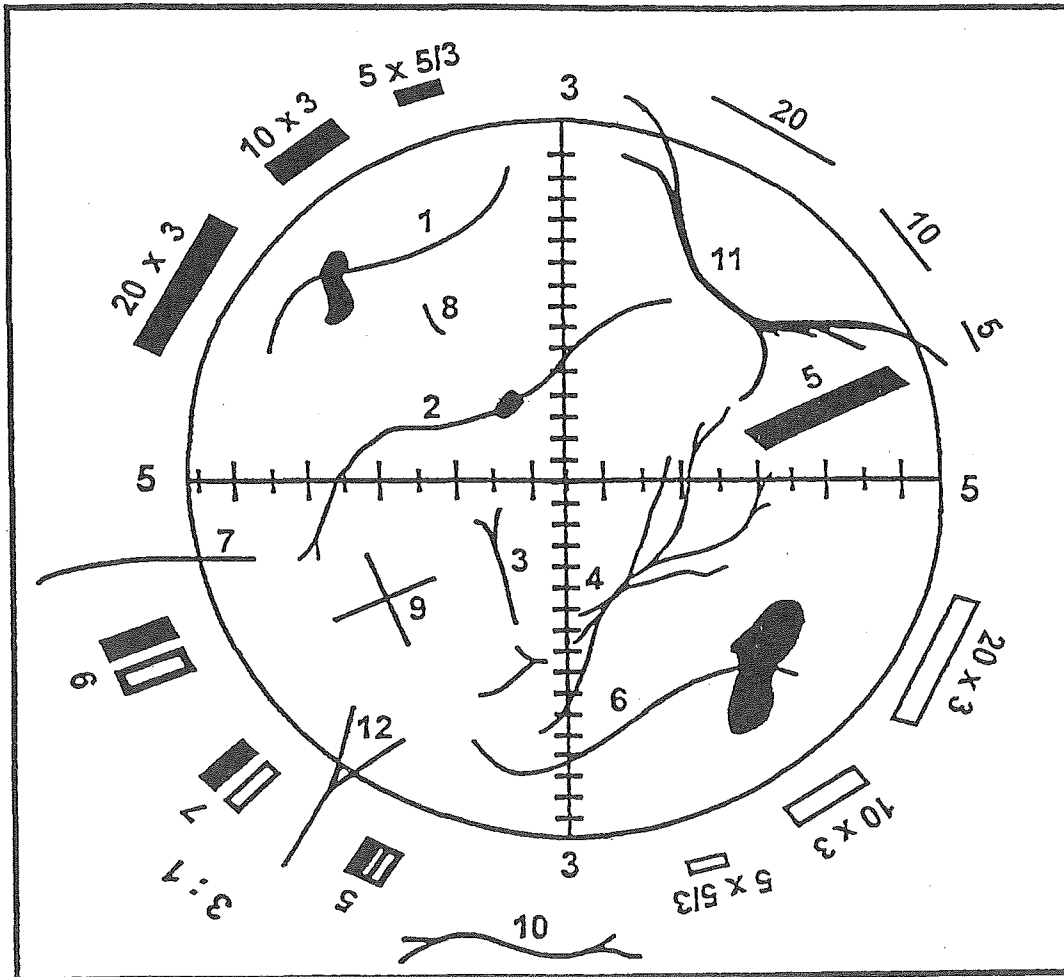


Figure 1: Walton-Beckett Graticule with some explanatory fibers.

Counts for the Fibers in the Figure

Structure No.	Count	Explanation
1 to 6	1	Single fibers all contained within the circle.
7	1/2	Fiber crosses circle once.
8	0	Fiber too short.
9	2	Two crossing fibers.
10	0	Fiber outside graticule.
11	0	Fiber crosses graticule twice.
12	1/2	Although split, fiber only crosses once.

(b) Equipment

(viii) High dispersion index of refraction oils (Special for

(i) Phase contrast microscope with 10x, 16x and 40x objectives, 10x wide-field eyepieces, G-22 Walton-Beckett graticule, Whipple disk, polarizer, analyzer and first order red or gypsum plate, 100 Watt illuminator, rotating position condenser with oversize phase rings, central stop dispersion objective, Kohler illumination and a rotating mechanical stage. (See Figure 1).

(ii) Stereo microscope with reflected light illumination, transmitted light illumination, polarizer, analyzer and first order red or gypsum plate, and rotating stage.

(iii) Negative pressure hood for the stereo microscope

(iv) Muffle furnace capable of 600 degrees C

(v) Drying oven capable of 50-150 degrees C

(vi) Aluminum specimen pans

(vii) Tongs for handling samples in the furnace dispersion staining.)

- n=1.550
- n=1.585
- n=1.590
- n=1.605
- n=1.620
- n=1.670
- n=1.680
- n=1.690

(ix) A set of index of refraction oils from about $n=1.350$ to $n=2.000$ in $n=0.005$ increments. (Standard for Becke line analysis.)

(x) Glass slides with painted or frosted ends 1 x 3 inches 1mm thick, precleaned.

(xi) Cover Slips 22 x 22 mm, #1 1/2

(xii) Paper clips or dissection needles

(xiii) Hand grinder

(xiv) Scalpel with both #10 and #11 blades

(xv) 0.1 molar HCl

(xvi) Decalcifying solution (Baxter Scientific Products)
Ethylenediaminetetraacetic Acid,

(xvii) Tetrasodium....0.7 g/l

Sodium Potassium Tartrate....8.0 mg/liter

Hydrochloric Acid....99.2 g/liter

Sodium Tartrate....0.14 g/liter

Tetrahydrofuran (THF)

(xviii) Hotplate capable of 60 degrees C

(xix) Balance

(xx) Hacksaw blade

(xxi) Ruby mortar and pestle

(c) Sample Pre-Preparation

Sample preparation begins with pre-preparation which may include chemical reduction of the matrix, heating the sample to dryness or heating in the muffle furnace. The end result is a sample which has been reduced to a powder that is sufficiently fine to fit under the cover slip. Analyze different phases of samples separately, e.g., tile and the tile mastic should be analyzed separately as the mastic may contain asbestos while the tile may not.

(i) Wet Samples

Samples with a high water content will not give the proper dispersion colors and must be dried prior to sample mounting. Remove the lid of the scintillation vial, place the bottle in the drying oven and heat at 100 degrees C to dryness (usually about 2 h). Samples which are not submitted to the lab in glass must be removed and placed in glass vials or aluminum weighing pans before placing them in the drying oven.

(ii) Samples With Organic Interference-Muffle Furnace

These may include samples with tar as a matrix, vinyl asbestos tile, or any other organic that can be reduced by heating. Remove the sample from the vial and weigh in a balance to determine the weight of the submitted portion. Place the sample in a muffle furnace at 500 degrees C for 1 to 2 h or until all obvious organic material has been removed. Retrieve, cool and weigh again to determine the weight loss on ignition. This is necessary to determine the asbestos content of the submitted sample, because the analyst will be looking at a reduced sample.

Notes: Heating above 600 degrees C will cause the sample to undergo a structural change which, given sufficient

time, will convert the chrysotile to forsterite. Heating even at lower temperatures for 1 to 2 h may have a measurable effect on the optical properties of the minerals. If the analyst is unsure of what to expect, a sample of standard asbestos should be heated to the same temperature for the same length of time so that it can be examined for the proper interpretation.

(iii) Samples With Organic Interference-THF

Vinyl asbestos tile is the most common material treated with this solvent, although, substances containing tar will sometimes yield to this treatment. Select a portion of the material and then grind it up if possible. Weigh the sample and place it in a test tube. Add sufficient THF to dissolve the organic matrix. This is usually about 4 to 5 mL. Remember, THF is highly flammable. Filter the remaining material through a tared silver membrane, dry and weigh to determine how much is left after the solvent extraction. Further process the sample to remove carbonate or mount directly.

(iv) Samples With Carbonate Interference

Carbonate material is often found on fibers and sometimes must be removed in order to perform dispersion microscopy. Weigh out a portion of the material and place it in a test tube. Add a sufficient amount of 0.1 M HCl or decalcifying solution in the tube to react all the carbonate as evidenced by gas formation; i.e., when the gas bubbles stop, add a little more solution. If no more gas forms, the reaction is complete. Filter the material out through a tared silver membrane, dry and weigh to determine the weight lost.

(d) Sample Preparation

Samples must be prepared so that accurate determination can be made of the asbestos type and amount present. The following steps are carried out in the low-flow hood (a low-flow hood has less than 50 fpm flow):

(i) If the sample has large lumps, is hard, or cannot be made to lie under a cover slip, the grain size must be reduced. Place a small amount between two slides and grind the material between them or grind a small amount in a clean mortar and pestle. The choice of whether to use an alumina, ruby, or diamond mortar depends on the hardness of the material. Impact damage can alter the asbestos mineral if too much mechanical shock occurs. (Freezer mills can completely destroy the observable crystallinity of asbestos and should not be used). For some samples, a portion of material can be shaved off with a scalpel, ground off with a hand grinder or hacksaw blade.

The preparation tools should either be disposable or cleaned thoroughly. Use vigorous scrubbing to loosen the fibers during the washing. Rinse the implements with copious amounts of water and air-dry in a dust-free environment.

(ii) If the sample is powder or has been reduced as in (i) above, it is ready to mount. Place a glass slide on a piece of optical tissue and write the identification on the painted or frosted end. Place two drops of index of refraction medium $n=1.550$ on the slide. (The medium $n=1.550$ is chosen because it is the matching index for chrysotile.) Dip the end of a clean paper-clip or dissecting needle into the droplet of refraction medium on the slide to moisten it. Then dip the probe into the powder sample. Transfer what sticks on the probe to the slide. The material on the end of the probe should have a diameter of about 3 mm for a good mount. If the mate-

rial is very fine, less sample may be appropriate. For nonpowder samples such as fiber mats, forceps should be used to transfer a small amount of material to the slide. Stir the material in the medium on the slide, spreading it out and making the preparation as uniform as possible. Place a cover-slip on the preparation by gently lowering onto the slide and allowing it to fall "trapdoor" fashion on the preparation to push out any bubbles. Press gently on the cover slip to even out the distribution of particulate on the slide. If there is insufficient mounting oil on the slide, one or two drops may be placed near the edge of the coverslip on the slide. Capillary action will draw the necessary amount of liquid into the preparation. Remove excess oil with the point of a laboratory wiper.

Treat at least two different areas of each phase in this fashion. Choose representative areas of the sample. It may be useful to select particular areas or fibers for analysis. This is useful to identify asbestos in severely inhomogeneous samples.

When it is determined that amphiboles may be present, repeat the above process using the appropriate high-dispersion oils until an identification is made or all six asbestos minerals have been ruled out. Note that percent determination must be done in the index medium 1.550 because amphiboles tend to disappear in their matching mediums.

(e) Analytical procedure

Note: This method presumes some knowledge of mineralogy and optical petrography.

The analysis consists of three parts: The determination of whether there is asbestos present, what type is present and the determination of how much is present. The general flow of the analysis is:

- (i) Gross examination.
- (ii) Examination under polarized light on the stereo microscope.
- (iii) Examination by phase-polar illumination on the compound phase microscope.
- (iv) Determination of species by dispersion stain. Examination by Becke line analysis may also be used; however, this is usually more cumbersome for asbestos determination.

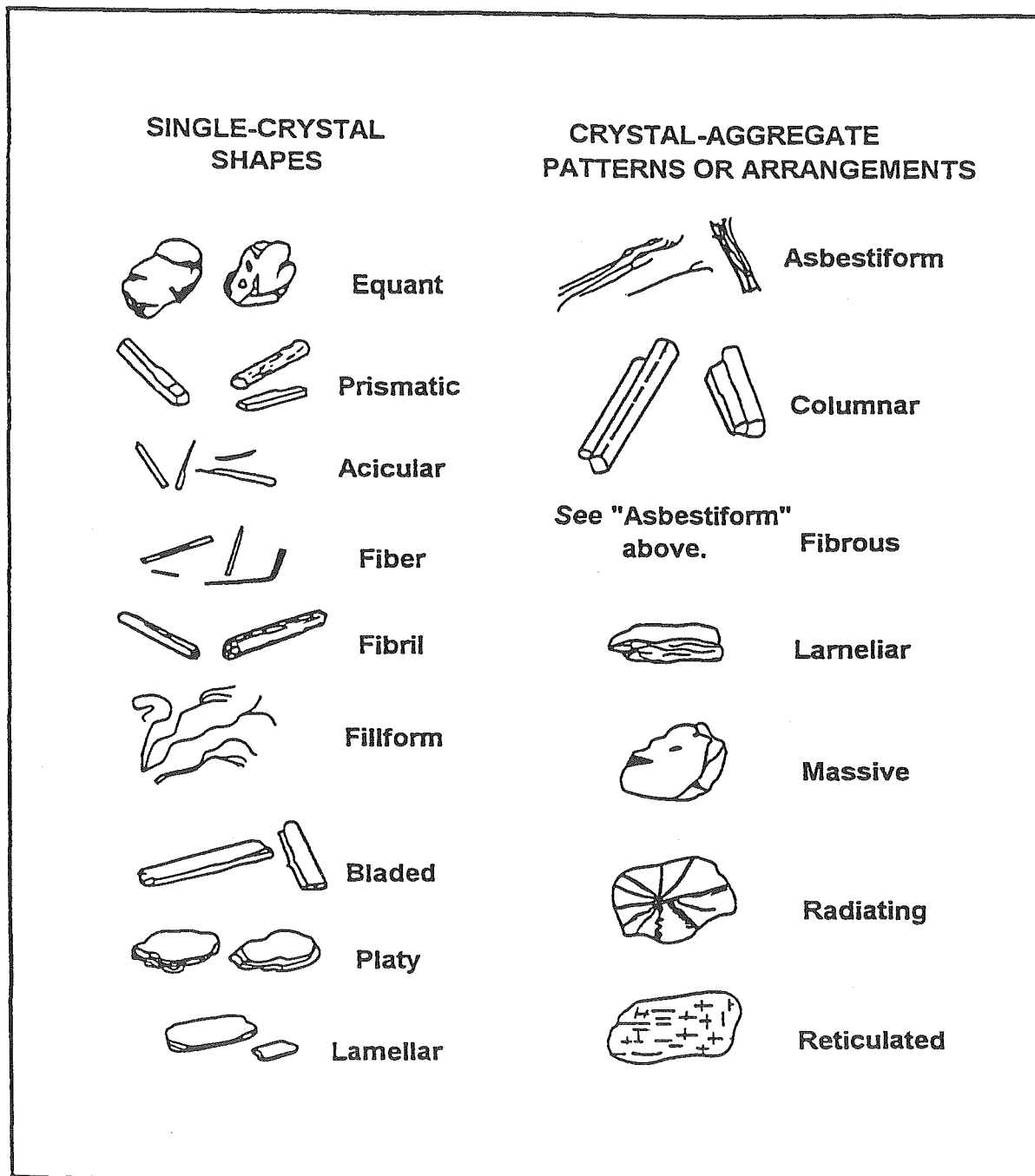


Figure 1. Particle definitions showing mineral growth habits.
From the U.S. Bureau of Mines.

(v) Difficult samples may need to be analyzed by SEM or TEM, or the results from those techniques combined with light microscopy for a definitive identification. Identification of a particle as asbestos requires that it be asbestiform. Description of particles should follow the suggestion of Campbell. (Figure 2)

For the purpose of regulation, the mineral must be one of the six minerals covered and must be in the asbestos growth habit. Large specimen samples of asbestos generally have the gross appearance of wood. Fibers are easily parted from it. Asbestos fibers are very long compared with their widths.

The fibers have a very high tensile strength as demonstrated by bending without breaking. Asbestos fibers exist in bundles that are easily parted, show longitudinal fine structure and may be tufted at the ends showing "bundle of sticks" morphology. In the microscope some of these properties may not be observable. Amphiboles do not always show striations along their length even when they are asbestos. Neither will they always show tufting. They generally do not show a curved nature except for very long fibers. Asbestos and asbestiform minerals are usually characterized in groups by extremely high aspect ratios (greater than 100:1). While

aspect ratio analysis is useful for characterizing populations of fibers, it cannot be used to identify individual fibers of intermediate to short aspect ratio. Observation of many fibers is often necessary to determine whether a sample consists of "cleavage fragments" or of asbestos fibers.

Most cleavage fragments of the asbestos minerals are easily distinguishable from true asbestos fibers. This is because true cleavage fragments usually have larger diameters than 1 micron. Internal structure of particles larger than this usually shows them to have no internal fibrillar structure. In addition, cleavage fragments of the monoclinic amphiboles show inclined extinction under crossed polars with no compensator. Asbestos fibers usually show extinction at zero degrees or ambiguous extinction if any at all. Morphologically, the larger cleavage fragments are obvious by their blunt or stepped ends showing prismatic habit. Also, they tend to be acicular rather than filiform.

Where the particles are less than 1 micron in diameter and have an aspect ratio greater than or equal to 3:1, it is recommended that the sample be analyzed by SEM or TEM if there is any question whether the fibers are cleavage fragments or asbestiform particles.

Care must be taken when analyzing by electron microscopy because the interferences are different from those in light microscopy and may structurally be very similar to asbestos. The classic interference is between anthophyllite and biopyribole or intermediate fiber. Use the same morphological clues for electron microscopy as are used for light microscopy, e.g. fibril splitting, internal longitudinal striation, fraying, curvature, etc.

(vi) Gross examination:

Examine the sample, preferably in the glass vial. Determine the presence of any obvious fibrous component. Estimate a percentage based on previous experience and current observation. Determine whether any pre-preparation is necessary. Determine the number of phases present. This step may be carried out or augmented by observation at 6x to 40x under a stereo microscope.

(vii) After performing any necessary pre-preparation, prepare slides of each phase as described above. Two preparations of the same phase in the same index medium can be made side-by-side on the same glass for convenience. Examine with the polarizing stereo microscope. Estimate the percentage of asbestos based on the amount of birefringent fiber present.

(viii) Examine the slides on the phase-polar microscopes at magnifications of 160x and 400x. Note the morphology of the fibers. Long, thin, very straight fibers with little curvature are indicative of fibers from the amphibole family. Curved, wavy fibers are usually indicative of chrysotile. Estimate the percentage of asbestos on the phase-polar microscope under conditions of crossed polars and a gypsum plate. Fibers smaller than 1.0 microns in thickness must be identified by inference to the presence of larger, identifiable fibers and morphology. If no larger fibers are visible, electron microscopy should be performed. At this point, only a tentative identification can be made. Full identification must be made with dispersion microscopy. Details of the tests are included in the appendices.

(ix) Once fibers have been determined to be present, they must be identified. Adjust the microscope for dispersion mode and observe the fibers. The microscope has a rotating stage, one polarizing element, and a system for generating dark-field dispersion microscopy (see subsection (4)(f) of this appendix). Align a fiber with its length parallel to the polarizer and note the color of the Becke lines. Rotate the stage to bring the fiber length perpendicular to the polarizer and note the color. Repeat this process for every fiber or fiber bundle examined. The colors must be consistent with the colors generated by standard asbestos reference materials for a positive identification. In $n=1.550$, amphiboles will generally show a yellow to straw-yellow color indicating that the fiber indices of refraction are higher than the liquid. If long, thin fibers are noted and the colors are yellow, prepare further slides as above in the suggested matching liquids listed below:

Type of asbestos	Index of refraction
Chrysotile	$n=1.550$.
Amosite	$n=1.670$ or 1.680 .
Crocidolite	$n=1.690$.
Anthophyllite	$n=1.605$ and 1.620 .
Tremolite	$n=1.605$ and 1.620 .
Actinolite	$n=1.620$.

Where more than one liquid is suggested, the first is preferred; however, in some cases this liquid will not give good dispersion color. Take care to avoid interferences in the other liquid; e.g., wollastonite in $n=1.620$ will give the same colors as tremolite. In $n=1.605$ wollastonite will appear yellow in all directions. Wollastonite may be determined under crossed polars as it will change from blue to yellow as it is rotated along its fiber axis by tapping on the cover slip. Asbestos minerals will not change in this way.

Determination of the angle of extinction may, when present, aid in the determination of anthophyllite from tremolite. True asbestos fibers usually have 0 degree extinction or ambiguous extinction, while cleavage fragments have more definite extinction.

Continue analysis until both preparations have been examined and all present species of asbestos are identified. If there are no fibers present, or there is less than 0.1% present, end the analysis with the minimum number of slides (2).

(x) Some fibers have a coating on them which makes dispersion microscopy very difficult or impossible. Becke line analysis or electron microscopy may be performed in those cases. Determine the percentage by light microscopy. TEM analysis tends to overestimate the actual percentage present.

(xi) Percentage determination is an estimate of occluded area, tempered by gross observation. Gross observation information is used to make sure that the high magnification microscopy does not greatly over- or under-estimate the amount of fiber present. This part of the analysis requires a great deal of experience. Satisfactory models for asbestos content analysis have not yet been developed, although some models based on metallurgical grain-size determination have found some utility. Estimation is more easily handled in situations where the grain sizes visible at about 160x are about the same and the sample is relatively homogeneous.

View all of the area under the cover slip to make the percentage determination. View the fields while moving the stage, paying attention to the clumps of material. These are not usually the best areas to perform dispersion microscopy because of the interference from other materials. But, they are the areas most likely to represent the accurate percentage in the sample. Small amounts of asbestos require slower scanning and more frequent analysis of individual fields.

Report the area occluded by asbestos as the concentration. This estimate does not generally take into consideration the difference in density of the different species present in the sample. For most samples this is adequate. Simulation studies with similar materials must be carried out to apply microvisual estimation for that purpose and is beyond the scope of this procedure.

(xii) Where successive concentrations have been made by chemical or physical means, the amount reported is the percentage of the material in the "as submitted" or original state. The percentage determined by microscopy is multiplied by the fractions remaining after pre-preparation steps to give the percentage in the original sample. For example:

Step 1. 60% remains after heating at 550 degrees C for 1 h.

Step 2. 30% of the residue of step 1 remains after dissolution of carbonate in 0.1 m HCl.

Step 3. Microvisual estimation determines that 5% of the sample is chrysotile asbestos.

The reported result is:

$R = (\text{Microvisual result in percent}) \times (\text{Fraction remaining after step 2}) \times (\text{Fraction remaining of original sample after step 1})$

$$R = (5) \times (.30) \times (.60) = 0.9\%$$

(xiii) Report the percent and type of asbestos present. For samples where asbestos was identified, but is less than 1.0%, report "Asbestos present, less than 1.0%." There must have been at least two observed fibers or fiber bundles in the two preparations to be reported as present. For samples where asbestos was not seen, report as "None Detected."

(4) Auxiliary Information

Because of the subjective nature of asbestos analysis, certain concepts and procedures need to be discussed in more depth. This information will help the analyst understand why some of the procedures are carried out the way they are.

(a) Light

Light is electromagnetic energy. It travels from its source in packets called quanta. It is instructive to consider light as a plane wave. The light has a direction of travel. Perpendicular to this and mutually perpendicular to each other, are two vector components. One is the magnetic vector and the other is the electric vector. We shall only be concerned with the electric vector. In this description, the interaction of the vector and the mineral will describe all the observable phenomena. From a light source such a microscope illuminator, light travels in all different direction from the filament.

In any given direction away from the filament, the electric vector is perpendicular to the direction of travel of a light ray. While perpendicular, its orientation is random about the travel axis. If the electric vectors from all the light rays were lined up by passing the light through a filter that would only

let light rays with electric vectors oriented in one direction pass, the light would then be POLARIZED.

Polarized light interacts with matter in the direction of the electric vector. This is the polarization direction. Using this property it is possible to use polarized light to probe different materials and identify them by how they interact with light. The speed of light in a vacuum is a constant at about 2.99×10^8 m/s. When light travels in different materials such as air, water, minerals or oil, it does not travel at this speed. It travels slower. This slowing is a function of both the material through which the light is traveling and the wavelength or frequency of the light. In general, the more dense the material, the slower the light travels. Also, generally, the higher the frequency, the slower the light will travel. The ratio of the speed of light in a vacuum to that in a material is called the index of refraction (n). It is usually measured at 589 nm (the sodium D line). If white light (light containing all the visible wavelengths) travels through a material, rays of longer wavelengths will travel faster than those of shorter wavelengths, this separation is called dispersion. Dispersion is used as an identifier of materials as described in Section (4)(f).

(b) Material Properties

Materials are either amorphous or crystalline. The difference between these two descriptions depends on the positions of the atoms in them. The atoms in amorphous materials are randomly arranged with no long range order. An example of an amorphous material is glass. The atoms in crystalline materials, on the other hand, are in regular arrays and have long range order. Most of the atoms can be found in highly predictable locations. Examples of crystalline material are salt, gold, and the asbestos minerals.

It is beyond the scope of this method to describe the different types of crystalline materials that can be found, or the full description of the classes into which they can fall. However, some general crystallography is provided below to give a foundation to the procedures described.

With the exception of anthophyllite, all the asbestos minerals belong to the monoclinic crystal type. The unit cell is the basic repeating unit of the crystal and for monoclinic crystals can be described as having three unequal sides, two 90 degrees angles and one angle not equal to 90 degrees. The orthorhombic group, of which anthophyllite is a member has three unequal sides and three 90 degrees angles. The unequal sides are a consequence of the complexity of fitting the different atoms into the unit cell. Although the atoms are in a regular array, that array is not symmetrical in all directions. There is long range order in the three major directions of the crystal. However, the order is different in each of the three directions. This has the effect that the index of refraction is different in each of the three directions. Using polarized light, we can investigate the index of refraction in each of the directions and identify the mineral or material under investigation. The indices alpha, beta, and gamma are used to identify the lowest, middle, and highest index of refraction respectively. The x direction, associated with alpha is called the fast axis. Conversely, the z direction is associated with gamma and is the slow direction. Crocidolite has alpha along the fiber length making it "length-fast." The remainder of the asbestos minerals have the gamma axis along the fiber length. They

are called "length-slow." This orientation to fiber length is used to aid in the identification of asbestos.

(c) Polarized Light Technique

Polarized light microscopy as described in this section uses the phase-polar microscope described in Section (3)(b). A phase contrast microscope is fitted with two polarizing elements, one below and one above the sample. The polarizers have their polarization directions at right angles to each other. Depending on the tests performed, there may be a compensator between these two polarizing elements. Light emerging from a polarizing element has its electric vector pointing in the polarization direction of the element. The light will not be subsequently transmitted through a second element set at a right angle to the first element. Unless the light is altered as it passes from one element to the other, there is no transmission of light.

(d) Angle of Extinction

Crystals which have different crystal regularity in two or three main directions are said to be anisotropic. They have a different index of refraction in each of the main directions. When such a crystal is inserted between the crossed polars, the field of view is no longer dark but shows the crystal in color. The color depends on the properties of the crystal. The light acts as if it travels through the crystal along the optical axes. If a crystal optical axis were lined up along one of the polarizing directions (either the polarizer or the analyzer) the light would appear to travel only in that direction, and it would blink out or go dark. The difference in degrees between the fiber direction and the angle at which it blinks out is called the angle of extinction. When this angle can be measured, it is useful in identifying the mineral. The procedure for measuring the angle of extinction is to first identify the polarization direction in the microscope. A commercial alignment slide can be used to establish the polarization directions or use anthophyllite or another suitable mineral. This mineral has a zero degree angle of extinction and will go dark to extinction as it aligns with the polarization directions. When a fiber of anthophyllite has gone to extinction, align the eyepiece reticle or graticule with the fiber so that there is a visual cue as to the direction of polarization in the field of view. Tape or otherwise secure the eyepiece in this position so it will not shift.

After the polarization direction has been identified in the field of view, move the particle of interest to the center of the field of view and align it with the polarization direction. For fibers, align the fiber along this direction. Note the angular reading of the rotating stage. Looking at the particle, rotate the stage until the fiber goes dark or "blinks out." Again note the reading of the stage. The difference in the first reading and the second is an angle of extinction.

The angle measured may vary as the orientation of the fiber changes about its long axis. Tables of mineralogical data usually report the maximum angle of extinction. Asbestos forming minerals, when they exhibit an angle of extinction, usually do show an angle of extinction close to the reported maximum, or as appropriate depending on the substitution chemistry.

(e) Crossed Polars With Compensator

When the optical axes of a crystal are not lined up along one of the polarizing directions (either the polarizer or the

analyzer) part of the light travels along one axis and part travels along the other visible axis. This is characteristic of birefringent materials.

The color depends on the difference of the two visible indices of refraction and the thickness of the crystal. The maximum difference available is the difference between the alpha and the gamma axes. This maximum difference is usually tabulated as the birefringence of the crystal.

For this test, align the fiber at 45 degrees to the polarization directions in order to maximize the contribution to each of the optical axes. The colors seen are called retardation colors. They arise from the recombination of light which has traveled through the two separate directions of the crystal. One of the rays is retarded behind the other since the light in that direction travels slower. On recombination, some of the colors which make up white light are enhanced by constructive interference and some are suppressed by destructive interference. The result is a color dependent on the difference between the indices and the thickness of the crystal. The proper colors, thicknesses, and retardations are shown on a Michel-Levy chart. The three items, retardation, thickness and birefringence are related by the following relationship:

$$R = t (n_{\gamma} - \alpha)$$

R= retardation, t= crystal thickness in micron, and alpha, gamma= indices of refraction.

Examination of the equation for asbestos minerals reveals that the visible colors for almost all common asbestos minerals and fiber sizes are shades of gray and black. The eye is relatively poor at discriminating different shades of gray. It is very good at discriminating different colors. In order to compensate for the low retardation, a compensator is added to the light train between the polarization elements. The compensator used for this test is a gypsum plate of known thickness and birefringence. Such a compensator when oriented at 45 degrees to the polarizer direction, provides a retardation of 530 nm of the 530 nm wavelength color. This enhances the red color and gives the background a characteristic red to red-magenta color. If this "full-wave" compensator is in place when the asbestos preparation is inserted into the light train, the colors seen on the fibers are quite different. Gypsum, like asbestos has a fast axis and a slow axis. When a fiber is aligned with its fast axis in the same direction as the fast axis of the gypsum plate, the ray vibrating in the slow direction is retarded by both the asbestos and the gypsum. This results in a higher retardation than would be present for either of the two minerals. The color seen is a second order blue. When the fiber is rotated 90 degrees using the rotating stage, the slow direction of the fiber is now aligned with the fast direction of the gypsum and the fast direction of the fiber is aligned with the slow direction of the gypsum. Thus, one ray vibrates faster in the fast direction of the gypsum, and slower in the slow direction of the fiber; the other ray will vibrate slower in the slow direction of the gypsum and faster in the fast direction of the fiber. In this case, the effect is subtractive and the color seen is a first order yellow. As long as the fiber thickness does not add appreciably to the color, the same basic colors will be seen for all asbestos types except crocidolite. In crocidolite the colors will be weaker, may be in the

opposite directions, and will be altered by the blue absorption color natural to crocidolite. Hundreds of other materials will give the same colors as asbestos, and therefore, this test is not definitive for asbestos. The test is useful in discriminating against fiberglass or other amorphous fibers such as some synthetic fibers. Certain synthetic fibers will show retardation colors different than asbestos; however, there are some forms of polyethylene and aramid which will show morphology and retardation colors similar to asbestos minerals. This test must be supplemented with a positive identification test when birefringent fibers are present which can not be excluded by morphology. This test is relatively ineffective for use on fibers less than 1 micron in diameter. For positive confirmation TEM or SEM should be used if no larger bundles or fibers are visible.

(f) Dispersion Staining

Dispersion microscopy or dispersion staining is the method of choice for the identification of asbestos in bulk materials. Becke line analysis is used by some laboratories and yields the same results as does dispersion staining for asbestos and can be used in lieu of dispersion staining. Dispersion staining is performed on the same platform as the phase-polar analysis with the analyzer and compensator removed. One polarizing element remains to define the direction of the light so that the different indices of refraction of the fibers may be separately determined. Dispersion microscopy is a dark-field technique when used for asbestos. Particles are imaged with scattered light. Light which is unscattered is blocked from reaching the eye either by the back field image mask in a McCrone objective or a back field image mask in the phase condenser. The most convenient method is to use the rotating phase condenser to move an oversized phase ring into place. The ideal size for this ring is for the central disk to be just larger than the objective entry aperture as viewed in the back focal plane. The larger the disk, the less scattered light reaches the eye. This will have the effect of diminishing the intensity of dispersion color and will shift the actual color seen. The colors seen vary even on microscopes from the same manufacturer. This is due to the different bands of wavelength exclusion by different mask sizes. The mask may either reside in the condenser or in the objective back focal plane. It is imperative that the analyst determine by experimentation with asbestos standards what the appropriate colors should be for each asbestos type. The colors depend also on the temperature of the preparation and the exact chemistry of the asbestos. Therefore, some slight differences from the standards should be allowed. This is not a serious problem for commercial asbestos uses. This technique is used for identification of the indices of refraction for fibers by recognition of color. There is no direct numerical readout of the index of refraction. Correlation of color to actual index of refraction is possible by referral to published conversion tables. This is not necessary for the analysis of asbestos. Recognition of appropriate colors along with the proper morphology are deemed sufficient to identify the commercial asbestos minerals. Other techniques including SEM, TEM, and XRD may be required to provide additional information in order to identify other types of asbestos.

Make a preparation in the suspected matching high dispersion oil, e.g., $n=1.550$ for chrysotile. Perform the prelimi-

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nary tests to determine whether the fibers are birefringent or not. Take note of the morphological character. Wavy fibers are indicative of chrysotile while long, straight, thin, frayed fibers are indicative of amphibole asbestos. This can aid in the selection of the appropriate matching oil. The microscope is set up and the polarization direction is noted as in Section (4)(d). Align a fiber with the polarization direction. Note the color. This is the color parallel to the polarizer. Then rotate the fiber rotating the stage 90 degrees so that the polarization direction is across the fiber. This is the perpendicular position. Again note the color. Both colors must be consistent with standard asbestos minerals in the correct direction for a positive identification of asbestos. If only one of the colors is correct while the other is not, the identification is not positive. If the colors in both directions are bluish-white, the analyst has chosen a matching index oil which is higher than the correct matching oil, e.g. the analyst has used $n=1.620$ where chrysotile is present. The next lower oil (Section (3)(e)) should be used to prepare another specimen. If the color in both directions is yellow-white to straw-yellow-white, this indicates that the index of the oil is lower than the index of the fiber, e.g. the preparation is in $n=1.550$ while anthophyllite is present. Select the next higher oil (Section (3)(e)) and prepare another slide. Continue in this fashion until a positive identification of all asbestos species present has been made or all possible asbestos species have been ruled out by negative results in this test. Certain plant fibers can have similar dispersion colors as asbestos. Take care to note and evaluate the morphology of the fibers or remove the plant fibers in preparation. Coating material on the fibers such as carbonate or vinyl may destroy the dispersion color. Usually, there will be some outcropping of fiber which will show the colors sufficient for identification. When this is not the case, treat the sample as described in Section (3)(c) and then perform dispersion staining. Some samples will yield to Becke line analysis if they are coated or electron microscopy can be used for identification.

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WAC 296-62-07755 Appendix K—Smoking cessation program information for asbestos, tremolite, anthophyllite, and actinolite—Nonmandatory. The following organizations provide smoking cessation information and program material:

(1) The National Cancer Institute operates a toll-free Cancer Information Service (CIS) with trained personnel to help you. Call 1-800-4-CANCER* to reach the CIS office serving your area, or write: Office of Cancer Communications, National Cancer Institute, National Institutes of Health, Building 31, Room 10A24, Bethesda, Maryland 20892.

(2) American Cancer Society, 3340 Peachtree Road, N.E., Atlanta, Georgia 30062, (404) 320-3333. The American Cancer Society (ACS) is a voluntary organization composed of 58 divisions and 3,100 local units. Through "The

Great American Smokeout" in November, the annual Cancer Crusade in April, and numerous educational materials, ACS helps people learn about the health hazards of smoking and become successful ex-smokers.

(3) American Heart Association, 7320 Greenville Avenue, Dallas, Texas 75231, (214) 750-5300. The American Heart Association (AHA) is a voluntary organization with 130,000 members (physicians, scientists, and laypersons) in 55 states and regional groups. AHA produces a variety of publications and audiovisual materials about the effects of smoking on the heart. AHA also has developed a guidebook for incorporating a weight-control component into smoking cessation programs.

(4) American Lung Association, 1740 Broadway, New York, New York 10019, (212) 245-8000. A voluntary organization of 7,500 members (physicians, nurses, and laypersons), the American Lung Association (ALA) conducts numerous public information programs about the health effect of smoking. ALA has 59 state and 85 local units. The organization actively supports legislation and information campaigns for nonsmokers' rights and provides help for smokers who want to quit, for example, through "Freedom From Smoking," a self-help smoking cessation program.

(5) Office on Smoking and Health, United States Department of Health and Human Services, 5600 Fishers Lane, Park Building, Room 110, Rockville, Maryland 20857. The Office on Smoking and Health (OSH) is the Department of Health and Human Services' lead agency in smoking control. OSH has sponsored distribution of publications on smoking-related topics, such as free flyers on relapse after initial quitting, helping a friend or family member quit smoking, the health hazards of smoking, and the effects of parental smoking on teenagers.

*In Hawaii, on Oahu call 524-1234 (call collect from neighboring islands), Spanish-speaking staff members are available during daytime hours to callers from the following areas: California, Florida, Georgia, Illinois, New Jersey (area code 210), New York, and Texas. Consult your local telephone directory for listings of local chapters.

[Statutory Authority: Chapter 49.17 RCW. 91-03-044 (Order 90-18), § 296-62-07755, filed 1/10/91, effective 2/12/91.]

PART J—BIOLOGICAL AGENTS

WAC 296-62-080 Biological agents. (1) Definition. Biological agents are organisms or their by-products.

(2) Protection from exposure. Workmen shall be protected from exposure to hazardous concentrations of biological agents which may arise from processing, handling or using materials or waste.

[Order 73-3, § 296-62-080, filed 5/7/73; Order 70-8, § 296-62-080, filed 7/31/70, effective 9/1/70; Rule 8.010, effective 8/1/63.]

WAC 296-62-08001 Bloodborne pathogens. (1) Scope and application. This section applies to all occupational exposure to blood or other potentially infectious materials as defined by subsection (2) of this section.

(2) Definitions. For purposes of this section, the following shall apply:

"Blood" means human blood, human blood components, and products made from human blood.

"Bloodborne pathogens" means pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

"Clinical laboratory" means a workplace where diagnostic or other screening procedures are performed on blood or other potentially infectious materials.

"Contaminated" means the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

"Contaminated laundry" means laundry which has been soiled with blood or other potentially infectious materials or may contain contaminated sharps.

"Contaminated sharps" means any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

"Decontamination" means the use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

"Director" means the director of the Washington state department of labor and industries; the state designee for the Washington state plan.

"Engineering controls" means controls (e.g., sharps disposal containers, self-sheathing needles) that isolate or remove the bloodborne pathogens hazard from the workplace.

"Exposure incident" means a specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

"Handwashing facilities" means a facility providing an adequate supply of running potable water, soap and single use towels or hot air drying machines.

"Licensed healthcare professional" is a person whose legally permitted scope of practice allows him or her to independently perform the activities required by subsection (6) of this section, entitled Hepatitis B vaccination and post-exposure evaluation and follow-up.

"HBV" means hepatitis B virus.

"HIV" means human immunodeficiency virus.

"Occupational exposure" means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

"Other potentially infectious materials" means:

(a) The following human body fluids: Semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids;

(b) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and

(c) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

"Parenteral" means piercing mucous membranes or the skin barrier through such events as needlesticks, human bites, cuts, and abrasions.

"Personal protective equipment" is specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts, or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

"Production facility" means a facility engaged in industrial-scale, large-volume or high concentration production of HIV or HBV.

"Regulated waste" means liquid or semi-liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or other potentially infectious materials.

"Research laboratory" means a laboratory producing or using research-laboratory-scale amounts of HIV or HBV. Research laboratories may produce high concentrations of HIV or HBV but not in the volume found in production facilities.

"Source individual" means any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the employee. Examples include, but are not limited to, hospital and clinic patients; clients in institutions for the developmentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains; and individuals who donate or sell blood or blood components.

"Sterilize" means the use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

"Universal precautions" are an approach to infection control. According to the concept of universal precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

"Work practice controls" means controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

(3) Exposure control.

(a) Exposure control plan.

(i) Each employer having an employee(s) with occupational exposure as defined by subsection (2) of this section shall establish a written exposure control plan designed to eliminate or minimize employee exposure.

(ii) The exposure control plan shall contain at least the following elements:

(A) The exposure determination required by (b) of this subsection;

(B) The schedule and method of implementation for subsection (4) of this section, Methods of compliance; subsection (5) of this section, HIV and HBV research laboratories and production facilities; subsection (6) of this section, Hepatitis B vaccination and post-exposure evaluation and follow-up; subsection (7) of this section, Communication of hazards to employees; and subsection (8) of this section, Recordkeeping; and

(C) The procedure for the evaluation of circumstances surrounding exposure incidents as required by subsection (6)(c)(i) of this section.

(iii) Each employer shall ensure that a copy of the exposure control plan is accessible to employees in accordance with WAC 296-62-05209.

(iv) The exposure control plan shall be reviewed and updated at least annually, and whenever necessary to reflect new or modified tasks and procedures which affect occupational exposure, and to reflect new or revised employee positions with occupational exposure.

(v) The exposure control plan shall be made available to the director upon request for examination and copying.

(b) Exposure determination.

(i) Each employer who has an employee(s) with occupational exposure as defined by subsection (2) of this section shall prepare an exposure determination. This exposure determination shall contain the following:

(A) A list of all job classifications in which all employees in those job classifications have occupational exposure;

(B) A list of job classifications in which some employees have occupational exposure; and

(C) A list of all tasks and procedures or groups of closely related tasks and procedures in which occupational exposure occurs, and that are performed by employees in job classifications listed in accordance with the provisions of (b)(i)(B) of this subsection.

(ii) This exposure determination shall be made without regard to the use of personal protective equipment.

(4) Methods of compliance.

(a) General. Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

(b) Engineering and work practice controls.

(i) Engineering and work practice controls shall be used to eliminate or minimize employee exposure. Where occupational exposure remains after institution of these controls, personal protective equipment shall also be used.

(ii) Engineering controls shall be examined and maintained or replaced on a regular schedule to ensure their effectiveness.

(iii) Employers shall provide handwashing facilities which are readily accessible to employees.

(iv) When provision of handwashing facilities is not feasible, the employer shall provide either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.

(v) Employers shall ensure that employees wash their hands immediately or as soon as feasible after removal of gloves or other personal protective equipment.

(vi) Employers shall ensure that employees wash hands and any other skin with soap and water, or flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials.

(vii) Contaminated needles and other contaminated sharps shall not be bent, recapped, or removed except as noted in (b)(vii)(A) and (B) of this subsection. Shearing or breaking of contaminated needles is prohibited.

(A) Contaminated needles and other contaminated sharps shall not be bent, recapped or removed unless the employer can demonstrate that no alternative is feasible or that such action is required by a specific medical or dental procedure.

(B) Such bending, recapping or needle removal must be accomplished through the use of a mechanical device or a one-handed technique.

(viii) Immediately or as soon as possible after use, contaminated reusable sharps shall be placed in appropriate containers until properly reprocessed. These containers shall be:

(A) Puncture resistant;

(B) Labeled or color-coded in accordance with this standard;

(C) Leakproof on the sides and bottom; and

(D) In accordance with the requirements set forth in (d)(ii)(E) of this subsection for reusable sharps.

(ix) Eating, drinking, smoking, applying cosmetics, or lip balm, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure.

(x) Food and drink shall not be kept in refrigerators, freezers, shelves, cabinets, or on countertops or benchtops where blood or other potentially infectious materials are present.

(xi) All procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances.

(xii) Mouth pipetting/suctioning of blood or other potentially infectious materials is prohibited.

(xiii) Specimens of blood or other potentially infectious materials shall be placed in a container which prevents leakage during collection, handling, processing, storage, transport, or shipping.

(A) The container for storage, transport, or shipping shall be labeled or color-coded according to subsection (7)(a)(i) of this section and closed prior to being stored, transported, or shipped. When a facility utilizes universal precautions in the handling of all specimens, the labeling/color-coding of specimens is not necessary provided containers are recognizable as containing specimens. This exemption only applies while such specimens/containers remain within the facility. Labeling or color-coding in accordance with subsection (7)(a)(i) of this section is required when such specimens/containers leave the facility.

(B) If outside contamination of the primary container occurs, the primary container shall be placed within a second

container which prevents leakage during handling, processing, storage, transport, or shipping and is labeled or color-coded according to the requirements of this standard.

(C) If the specimen could puncture the primary container, the primary container shall be placed within a secondary container which is punctured-resistant in addition to the above characteristics.

(xiv) Equipment which may become contaminated with blood or other potentially infectious materials shall be examined prior to servicing or shipping and shall be decontaminated as necessary, unless the employer can demonstrate that decontamination of such equipment or portions of such equipment is not feasible.

(A) A readily observable label in accordance with subsection (7)(a)(i)(H) of this section shall be attached to the equipment stating which portions remain contaminated.

(B) The employer shall ensure that this information is conveyed to all affected employees, the servicing representative, and/or the manufacturer, as appropriate, prior to handling, servicing, or shipping so that appropriate precautions will be taken.

(c) Personal protective equipment.

(i) Provision. When there is occupational exposure, the employer shall provide, at no cost to the employee, appropriate personal protective equipment such as, but not limited to, gloves, gowns, laboratory coats, face shields or masks and eye protection, and mouthpieces, resuscitation bags, pocket masks, or other ventilation devices. Personal protective equipment will be considered "appropriate" only if it does not permit blood or other potentially infectious materials to pass through to or reach the employee's work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used.

(ii) Use. The employer shall ensure that the employee uses appropriate personal protective equipment unless the employer shows that the employee temporarily and briefly declined to use personal protective equipment when, under rare and extraordinary circumstances, it was the employee's professional judgment that in the specific instance its use would have prevented the delivery of health care or public safety services or would have posed an increased hazard to the safety of the worker or the co-worker. When the employee makes this judgment, the circumstances shall be investigated and documented in order to determine whether changes can be instituted to prevent such occurrences in the future.

(iii) Accessibility. The employer shall ensure that appropriate personal protective equipment in the appropriate sizes is readily accessible at the worksite or is issued to employees. Hypoallergenic gloves, glove liners, powderless gloves, or other similar alternatives shall be readily accessible to those employees who are allergic to the gloves normally provided.

(iv) Cleaning, laundering, and disposal. The employer shall clean, launder, and dispose of personal protective equipment required by subsections (4) and (5) of this section, at no cost to the employee.

(v) Repair and replacement. The employer shall repair or replace personal protective equipment as needed to maintain its effectiveness, at no cost to the employee.

(vi) If a garment(s) is penetrated by blood or other potentially infectious materials, the garment(s) shall be removed immediately or as soon as feasible.

(vii) All personal protective equipment shall be removed prior to leaving the work area.

(viii) When personal protective equipment is removed it shall be placed in an appropriately designated area or container for storage, washing, decontamination, or disposal.

(ix) Gloves. Gloves shall be worn when it can be reasonably anticipated that the employee may have hand contact with blood, other potentially infectious materials, mucous membranes, and nonintact skin; when performing vascular access procedures except as specified in (c)(ix)(D) of this subsection; and when handling or touching contaminated items or surfaces.

(A) Disposable (single use) gloves such as surgical or examination gloves, shall be replaced as soon as practical when contaminated or as soon as feasible if they are torn, punctured, or when their ability to function as a barrier is compromised.

(B) Disposable (single use) gloves shall not be washed or decontaminated for re-use.

(C) Utility gloves may be decontaminated for re-use if the integrity of the glove is not compromised. However, they must be discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration or when their ability to function as a barrier is compromised.

(D) If an employer in a volunteer blood donation center judges that routine gloving for all phlebotomies is not necessary then the employer shall:

(I) Periodically reevaluate this policy;

(II) Make gloves available to all employees who wish to use them for phlebotomy;

(III) Not discourage the use of gloves for phlebotomy; and

(IV) Require that gloves be used for phlebotomy in the following circumstances:

—When the employee has cuts, scratches, or other breaks in his or her skin;

—When the employee judges that hand contamination with blood may occur, for example, when performing phlebotomy on an uncooperative source individual; and

—When the employee is receiving training in phlebotomy.

(x) Masks, eye protection, and face shields. Masks in combination with eye protection devices, such as goggles or glasses with solid side shields, or chin-length face shields, shall be worn whenever splashes, spray, spatter, or droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated.

(xi) Gowns, aprons, and other protective body clothing. Appropriate protective clothing such as, but not limited to, gowns, aprons, lab coats, clinic jackets, or similar outer garments shall be worn in occupational exposure situations. The type and characteristics will depend upon the task and degree of exposure anticipated.

(xii) Surgical caps or hoods and/or shoe covers or boots shall be worn in instances when gross contamination can reasonably be anticipated (e.g., autopsies, orthopaedic surgery).

(d) Housekeeping.

(i) General. Employers shall ensure that the worksite is maintained in a clean and sanitary condition. The employer shall determine and implement an appropriate written schedule for cleaning and method of decontamination based upon the location within the facility, type of surface to be cleaned, type of soil present, and tasks or procedures being performed in the area.

(ii) All equipment and environmental and working surfaces shall be cleaned and decontaminated after contact with blood or other potentially infectious materials.

(A) Contaminated work surfaces shall be decontaminated with an appropriate disinfectant after completion of procedures; immediately or as soon as feasible when surfaces are overtly contaminated or after any spill of blood or other potentially infectious materials; and at the end of the workshift if the surface may have become contaminated since the last cleaning.

(B) Protective coverings, such as plastic wrap, aluminum foil, or imperviously-backed absorbent paper used to cover equipment and environmental surfaces, shall be removed and replaced as soon as feasible when they become overtly contaminated or at the end of the workshift if they may have become contaminated during the shift.

(C) All bins, pails, cans, and similar receptacles intended for reuse which have a reasonable likelihood for becoming contaminated with blood or other potentially infectious materials shall be inspected and decontaminated on a regularly scheduled basis and cleaned and decontaminated immediately or as soon as feasible upon visible contamination.

(D) Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means, such as a brush and dust pan, tongs, or forceps.

(E) Reusable sharps that are contaminated with blood or other potentially infectious materials shall not be stored or processed in a manner that requires employees to reach by hand into the containers where these sharps have been placed.

(iii) Regulated waste.

(A) Contaminated sharps discarding and containment.

(I) Contaminated sharps shall be discarded immediately or as soon as feasible in containers that are:

- Closable;
- Puncture resistant;
- Leakproof on sides and bottom; and
- Labeled or color-coded in accordance with subsection (7)(a)(i) of this section.

(II) During use, containers for contaminated sharps shall be:

—Easily accessible to personnel and located as close as is feasible to the immediate area where sharps are used or can be reasonably anticipated to be found (e.g., laundries);

- Maintained upright throughout use; and
- Replaced routinely and not be allowed to overfill.

(III) When moving containers of contaminated sharps from the area of use, the containers shall be:

—Closed immediately prior to removal or replacement to prevent spillage or protrusion of contents during handling, storage, transport, or shipping;

—Placed in a secondary container if leakage is possible. The second container shall be:

- Closable;
- Constructed to contain all contents and prevent leakage during handling, storage, transport, or shipping; and
- Labeled or color-coded according to subsection (7)(a)(i) of this section.

(IV) Reusable containers shall not be opened, emptied, or cleaned manually or in any other manner which would expose employees to the risk of percutaneous injury.

(B) Other regulated waste containment.

(I) Regulated waste shall be placed in containers which are:

- Closable;
- Constructed to contain all contents and prevent leakage of fluids during handling, storage, transport, or shipping;
- Labeled or color-coded in accordance with subsection (7)(a)(i) of this section; and
- Closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.

(II) If outside contamination of the regulated waste container occurs, it shall be placed in a second container. The second container shall be:

- Closable;
- Constructed to contain all contents and prevent leakage of fluids during handling, storage, transport, or shipping;
- Labeled or color-coded in accordance with subsection (7)(a)(i) of this section; and
- Closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.

(C) Disposal of all regulated waste shall be in accordance with applicable regulations of the United States, states and territories, and political subdivisions of states and territories.

(iv) Laundry.

(A) Contaminated laundry shall be handled as little as possible with a minimum of agitation.

(I) Contaminated laundry shall be bagged or containerized at the location where it was used and shall not be sorted or rinsed in the location of use.

(II) Contaminated laundry shall be placed and transported in bags or containers labeled or color-coded in accordance with subsection (7)(a)(i) of this section. When a facility utilizes universal precautions in the handling of all soiled laundry, alternative labeling or color-coding is sufficient if it permits all employees to recognize the containers as requiring compliance with universal precautions.

(III) Whenever contaminated laundry is wet and presents a reasonable likelihood of soak-through of or leakage from the bag or container, the laundry shall be placed and transported in bags or containers which prevent soak-through and/or leakage of fluids to the exterior.

(B) The employer shall ensure that employees who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment.

(C) When a facility ships contaminated laundry off-site to a second facility which does not utilize universal precautions in the handling of all laundry, the facility generating the

contaminated laundry must place such laundry in bags or containers which are labeled or color-coded in accordance with subsection (7)(a)(i) of this section.

(5) HIV and HBV research laboratories and production facilities.

(a) This subsection applies to research laboratories and production facilities engaged in the culture, production, concentration, experimentation, and manipulation of HIV and HBV. It does not apply to clinical or diagnostic laboratories engaged solely in the analysis of blood, tissues, or organs. These requirements apply in addition to the other requirements of the standard.

(b) Research laboratories and production facilities shall meet the following criteria:

(i) Standard microbiological practices. All regulated waste shall either be incinerated or decontaminated by a method such as autoclaving known to effectively destroy bloodborne pathogens.

(ii) Special practices.

(A) Laboratory doors shall be kept closed when work involving HIV or HBV is in progress.

(B) Contaminated materials that are to be decontaminated at a site away from the work area shall be placed in a durable, leakproof, labeled, or color-coded container that is closed before being removed from the work area.

(C) Access to the work area shall be limited to authorized persons. Written policies and procedures shall be established whereby only persons who have been advised of the potential biohazard, who meet any specific entry requirements, and who comply with all entry and exit procedures shall be allowed to enter the work areas and animal rooms.

(D) When other potentially infectious materials or infected animals are present in the work area or containment module, a hazard warning sign incorporating the universal biohazard symbol shall be posted on all access doors. The hazard warning sign shall comply with subsection (7)(a)(ii) of this section.

(E) All activities involving other potentially infectious materials shall be conducted in biological safety cabinets or other physical-containment devices within the containment module. No work with these other potentially infectious materials shall be conducted on the open bench.

(F) Laboratory coats, gowns, smocks, uniforms, or other appropriate protective clothing shall be used in the work area and animal rooms. Protective clothing shall not be worn outside of the work area and shall be decontaminated before being laundered.

(G) Special care shall be taken to avoid skin contact with other potentially infectious materials. Gloves shall be worn when handling infected animals and when making hand contact with other potentially infectious materials is unavoidable.

(H) Before disposal all waste from work areas and from animal rooms shall either be incinerated or decontaminated by a method such as autoclaving known to effectively destroy bloodborne pathogens.

(I) Vacuum lines shall be protected with liquid disinfectant traps and high-efficiency particulate air (HEPA) filters or filters of equivalent or superior efficiency and which are checked routinely and maintained or replaced as necessary.

(J) Hypodermic needles and syringes shall be used only for parenteral injection and aspiration of fluids from laboratory animals and diaphragm bottles. Only needle-locking syringes or disposable syringe-needle units (i.e., the needle is integral to the syringe) shall be used for the injection or aspiration of other potentially infectious materials. Extreme caution shall be used when handling needles and syringes. A needle shall not be bent, sheared, replaced in the sheath or guard, or removed from the syringe following use. The needle and syringe shall be promptly placed in a puncture-resistant container and autoclaved or decontaminated before reuse or disposal.

(K) All spills shall be immediately contained and cleaned up by appropriate professional staff or others properly trained and equipped to work with potentially concentrated infectious materials.

(L) A spill or accident that results in an exposure incident shall be immediately reported to the laboratory director or other responsible person.

(M) A biosafety manual shall be prepared or adopted and periodically reviewed and updated at least annually or more often if necessary. Personnel shall be advised of potential hazards, shall be required to read instructions on practices and procedures, and shall be required to follow them.

(iii) Containment equipment.

(A) Certified biological safety cabinets (Class I, II, or III) or other appropriate combinations of personal protection or physical containment devices, such as special protective clothing, respirators, centrifuge safety cups, sealed centrifuge rotors, and containment caging for animals, shall be used for all activities with other potentially infectious materials that pose a threat of exposure to droplets, splashes, spills, or aerosols.

(B) Biological safety cabinets shall be certified when installed, whenever they are moved and at least annually.

(c) HIV and HBV research laboratories shall meet the following criteria:

(i) Each laboratory shall contain a facility for hand washing and an eyewash facility which is readily available within the work area.

(ii) An autoclave for decontamination of regulated waste shall be available.

(d) HIV and HBV production facilities shall meet the following criteria:

(i) The work areas shall be separated from areas that are open to unrestricted traffic flow within the building. Passage through two sets of doors shall be the basic requirement for entry into the work area from access corridors or other contiguous areas. Physical separation of the high-containment work area from access corridors or other areas or activities may also be provided by a double-doored clothes-change room (showers may be included), airlock, or other access facility that requires passing through two sets of doors before entering the work area.

(ii) The surfaces of doors, walls, floors, and ceilings in the work area shall be water resistant so that they can be easily cleaned. Penetrations in these surfaces shall be sealed or capable of being sealed to facilitate decontamination.

(iii) Each work area shall contain a sink for washing hands and a readily available eye wash facility. The sink shall

be foot, elbow, or automatically operated and shall be located near the exit door of the work area.

(iv) Access doors to the work area or containment module shall be self-closing.

(v) An autoclave for decontamination of regulated waste shall be available within or as near as possible to the work area.

(vi) A ducted exhaust-air ventilation system shall be provided. This system shall create directional airflow that draws air into the work area through the entry area. The exhaust air shall not be recirculated to any other area of the building, shall be discharged to the outside, and shall be dispersed away from occupied areas and air intakes. The proper direction of the airflow shall be verified (i.e., into the work area).

(e) Training requirements. Additional training requirements for employees in HIV and HBV research laboratories and HIV and HBV production facilities are specified in subsection (7)(b)(ix) of this section.

(6) Hepatitis B vaccination and post-exposure evaluation and follow-up.

(a) General.

(i) The employer shall make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident.

(ii) The employer shall ensure that all medical evaluations and procedures including the hepatitis B vaccine and vaccination series and post-exposure evaluation and follow-up, including prophylaxis, are:

(A) Made available at no cost to the employee;

(B) Made available to the employee at a reasonable time and place;

(C) Performed by or under the supervision of a licensed physician or by or under the supervision of another licensed healthcare professional; and

(D) Provided according to recommendations of the United States Public Health Service current at the time these evaluations and procedures take place, except as specified by this subsection (6).

(iii) The employer shall ensure that all laboratory tests are conducted by an accredited laboratory at no cost to the employee.

(b) Hepatitis B vaccination.

(i) Hepatitis B vaccination shall be made available after the employee has received the training required in subsection (7)(b)(vii)(I) of this section and within ten working days of initial assignment to all employees who have occupational exposure unless the employee has previously received the complete hepatitis B vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons.

(ii) The employer shall not make participation in a pre-screening program a prerequisite for receiving hepatitis B vaccination.

(iii) If the employee initially declines hepatitis B vaccination but at a later date while still covered under the standard decides to accept the vaccination, the employer shall make available hepatitis B vaccination at that time.

(iv) The employer shall assure that employees who decline to accept hepatitis B vaccination offered by the

employer sign the statement in WAC 296-62-08050, appendix A.

(v) If a routine booster dose(s) of hepatitis B vaccine is recommended by the United States Public Health Service at a future date, such booster dose(s) shall be made available in accordance with (a)(ii) of this subsection.

(c) Post-exposure evaluation and follow-up. Following a report of an exposure incident, the employer shall make immediately available to the exposed employee a confidential medical evaluation and follow-up, including at least the following elements:

(i) Documentation of the route(s) of exposure, and the circumstances under which the exposure incident occurred;

(ii) Identification and documentation of the source individual, unless the employer can establish that identification is infeasible or prohibited by state or local law;

(A) The source individual's blood shall be tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity. If consent is not obtained, the employer shall establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, shall be tested and the results documented.

(B) When the source individual is already known to be infected with HBV or HIV, testing for the source individual's known HBV or HIV status need not be repeated.

(C) Results of the source individual's testing shall be made available to the exposed employee, and the employee shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.

(iii) Collection and testing of blood for HBV and HIV serological status;

(A) The exposed employee's blood shall be collected as soon as feasible and tested after consent is obtained.

(B) If the employee consents to baseline blood collection, but does not give consent at that time for HIV serologic testing, the sample shall be preserved for at least ninety days. If, within ninety days of the exposure incident, the employee elects to have the baseline sample tested, such testing shall be done as soon as feasible.

(iv) Post-exposure prophylaxis, when medically indicated, as recommended by the United States Public Health Service;

(v) Counseling; and

(vi) Evaluation of reported illnesses.

(d) Information provided to the healthcare professional.

(i) The employer shall ensure that the healthcare professional responsible for the employee's hepatitis B vaccination is provided a copy of this regulation.

(ii) The employer shall ensure that the healthcare professional evaluating an employee after an exposure incident is provided the following information:

(A) A copy of this regulation;

(B) A description of the exposed employee's duties as they relate to the exposure incident;

(C) Documentation of the route(s) of exposure and circumstances under which exposure occurred;

(D) Results of the source individual's blood testing, if available; and

(E) All medical records relevant to the appropriate treatment of the employee including vaccination status which are the employer's responsibility to maintain.

(e) Healthcare professional's written opinion. The employer shall obtain and provide the employee with a copy of the evaluating healthcare professional's written opinion within fifteen days of the completion of the evaluation.

(i) The healthcare professional's written opinion for hepatitis B vaccination shall be limited to whether hepatitis B vaccination is indicated for an employee, and if the employee has received such vaccination.

(ii) The healthcare professional's written opinion for post-exposure evaluation and follow-up shall be limited to the following information:

(A) That the employee has been informed of the results of the evaluation; and

(B) That the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation or treatment.

(iii) All other findings or diagnoses shall remain confidential and shall not be included in the written report.

(f) Medical recordkeeping. Medical records required by this standard shall be maintained in accordance with subsection (8)(a) of this section.

(7) Communication of hazards to employees.

(a) Labels and signs.

(i) Labels.

(A) Warning labels shall be affixed to containers of regulated waste, refrigerators and freezers containing blood or other potentially infectious material; and other containers used to store, transport or ship blood or other potentially infectious materials, except as provided in (a)(i)(E), (F), and (G) of this subsection.

(B) Labels required by this section shall include the following legend:



BIOHAZARD

(C) These labels shall be fluorescent orange or orange-red or predominantly so, with lettering and symbols in a contrasting color.

(D) Labels shall be affixed as close as feasible to the container by string, wire, adhesive, or other method that prevents their loss or unintentional removal.

(E) Red bags or red containers may be substituted for labels.

(F) Containers of blood, blood components, or blood products that are labeled as to their contents and have been released for transfusion or other clinical use are exempted

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from the labeling requirements of subsection (7) of this section.

(G) Individual containers of blood or other potentially infectious materials that are placed in a labeled container during storage, transport, shipment or disposal are exempted from the labeling requirement.

(H) Labels required for contaminated equipment shall be in accordance with this subitem and shall also state which portions of the equipment remain contaminated.

(I) Regulated waste that has been decontaminated need not be labeled or color-coded.

(ii) Signs.

(A) The employer shall post signs at the entrance to work areas specified in subsection (5) of this section, entitled HIV and HBV research laboratory and production facilities, which shall bear the following legend:



BIOHAZARD

(Name of the Infectious Agent)

(Special requirements for entering the area)

(Name, telephone number of the laboratory director or other responsible person.)

(B) These signs shall be fluorescent orange-red or predominantly so, with lettering and symbols in a contrasting color.

(b) Information and training.

(i) Employers shall ensure that all employees with occupational exposure participate in a training program which must be provided at no cost to the employee and during working hours.

(ii) Training shall be provided as follows:

(A) At the time of initial assignment to tasks where occupational exposure may take place;

(B) Within ninety days after the effective date of the standard; and

(C) At least annually thereafter.

(iii) For employees who have received training on blood-borne pathogens in the year preceding the effective date of the standard, only training with respect to the provisions of the standard which were not included need be provided.

(iv) Annual training for all employees shall be provided within one year of their previous training.

(v) Employers shall provide additional training when changes such as modification of tasks or procedures or institution of new tasks or procedures affect the employee's occupational exposure. The additional training may be limited to addressing the new exposures created.

(vi) Material appropriate in content and vocabulary to educational level, literacy, and language of employees shall be used.

(vii) The training program shall contain at a minimum the following elements:

(A) An accessible copy of the regulatory text of this standard and an explanation of its contents;

(B) A general explanation of the epidemiology and symptoms of bloodborne diseases;

(C) An explanation of the modes of transmission of bloodborne pathogens;

(D) An explanation of the employer's exposure control plan and the means by which the employee can obtain a copy of the written plan;

(E) An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;

(F) An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment;

(G) Information on the types, proper use, location, removal, handling, decontamination and disposal of personal protective equipment;

(H) An explanation of the basis for selection of personal protective equipment;

(I) Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;

(J) Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;

(K) An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;

(L) Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident;

(M) An explanation of the signs and labels and/or color coding required by (a) of this subsection; and

(N) An opportunity for interactive questions and answers with the person conducting the training session.

(viii) The person conducting the training shall be knowledgeable in the subject matter covered by the elements contained in the training program as it relates to the workplace that the training will address.

(ix) Additional initial training for employees in HIV and HBV laboratories and production facilities. Employees in HIV or HBV research laboratories and HIV or HBV production facilities shall receive the following initial training in addition to the above training requirements:

(A) The employer shall assure that employees demonstrate proficiency in standard microbiological practices and techniques and in the practices and operations specific to the facility before being allowed to work with HIV or HBV.

(B) The employer shall assure that employees have prior experience in the handling of human pathogens or tissue cultures before working with HIV or HBV.

(C) The employer shall provide a training program to employees who have no prior experience in handling human pathogens. Initial work activities shall not include the handling of infectious agents. A progression of work activities shall be assigned as techniques are learned and proficiency is developed. The employer shall assure that employees participate in work activities involving infectious agents only after proficiency has been demonstrated.

(8) Recordkeeping.

(a) Medical records.

(i) The employer shall establish and maintain an accurate record for each employee with occupational exposure, in accordance with WAC 296-62-052.

(ii) This record shall include:

(A) The name and Social Security number of the employee;

(B) A copy of the employee's hepatitis B vaccination status including the dates of all the hepatitis B vaccinations and any medical records relative to the employee's ability to receive vaccination as required by subsection (6)(b) of this section;

(C) A copy of all results of examinations, medical testing, and follow-up procedures as required by subsection (6)(c) of this section;

(D) The employer's copy of the healthcare professional's written opinion as required by subsection (6)(e) of this section; and

(E) A copy of the information provided to the healthcare professional as required by subsection (6)(d)(ii)(B), (C), and (D) of this section.

(iii) Confidentiality. The employer shall ensure that employee medical records required by (a) of this subsection are:

(A) Kept confidential; and

(B) Not disclosed or reported without the employee's express written consent to any person within or outside the workplace except as required by this section or as may be required by law.

(iv) The employer shall maintain the records required by subsection (8) of this section for at least the duration of employment plus thirty years in accordance with WAC 296-62-052.

(b) Training records.

(i) Training records shall include the following information:

(A) The dates of the training sessions;

(B) The contents or a summary of the training sessions;

(C) The names and qualifications of persons conducting the training; and

(D) The names and job titles of all persons attending the training sessions.

(ii) Training records shall be maintained for three years from the date on which the training occurred.

(c) Availability.

(i) The employer shall ensure that all records required to be maintained by this section shall be made available upon request to the director for examination and copying.

(ii) Employee training records required by this section shall be provided upon request for examination and copying

to employees, to employee representatives, and to the director.

(iii) Employee medical records required by this section shall be provided upon request for examination and copying to the subject employee, to anyone having written consent of the subject employee, to the director in accordance with WAC 296-62-052.

(d) Transfer of records.

(i) The employer shall comply with the requirements involving transfer of records set forth in WAC 296-62-052.

(ii) If the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall notify the director, at least three months prior to their disposal and transmit them to the director, if required by the director to do so, within that three-month period.

(9) Dates.

(a) Effective date. The standard shall become effective on May 26, 1992.

(b) The exposure control plan required by subsection (3) of this section shall be completed on or before June 26, 1992.

(c) Subsection (7)(b) of this section, entitled Information and training; and subsection (7)(h) of this section, entitled Recordkeeping; shall take effect on or before July 27, 1992.

(d) Subsection (4)(b) of this section, entitled Engineering and work practice controls; subsection (4)(c) of this section, entitled Personal protective equipment; subsection (4)(d) of this section, entitled Housekeeping; subsection (5) of this section, entitled HIV and HBV research laboratories and production facilities; subsection (6) of this section, entitled Hepatitis B vaccination and post-exposure evaluation and follow-up; and subsection (7)(a) of this section, entitled Labels and signs; shall take effect August 27, 1992.

[Statutory Authority: Chapter 49.17 RCW. 93-01-067 (Order 92-15), § 296-62-08001, filed 12/11/92, effective 1/15/93; 92-08-100 (Order 92-01), § 296-62-08001, filed 4/1/92, effective 5/5/92.]

WAC 296-62-08050 Appendix A—Hepatitis B vaccine declination—Mandatory. I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

[Statutory Authority: Chapter 49.17 RCW. 92-08-100 (Order 92-01), § 296-62-08050, filed 4/1/92, effective 5/5/92.]

Part J-1—PHYSICAL AGENTS

WAC 296-62-090 Physical agents.

[Order 73-3, § 296-62-090, filed 5/7/73; Order 70-8, § 296-62-090, filed 7/31/70, effective 9/1/70; Rule 9.010, effective 8/1/63.]

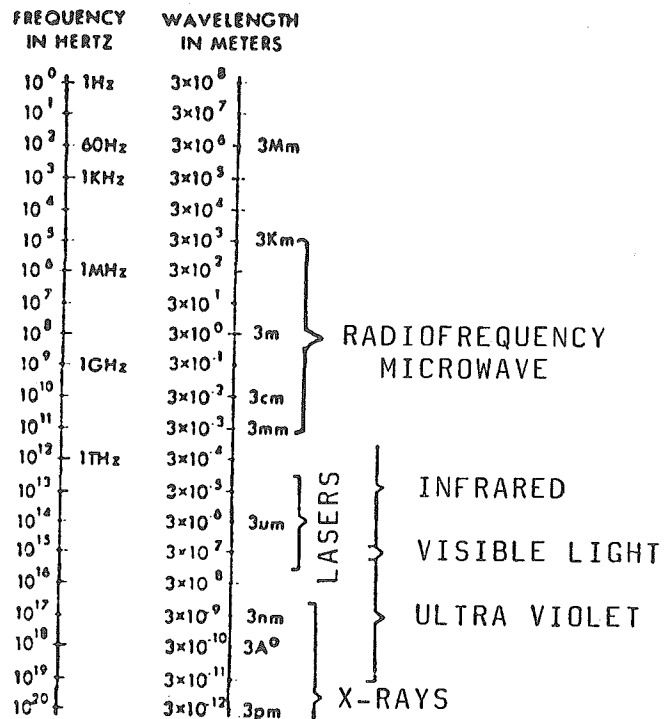
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WAC 296-62-09001 Definitions. (1) "Physical agents" shall mean, but are not limited to: Illumination, ionizing radiation, nonionizing radiation, pressure, vibration, temperature and humidity, and noise.

(2) "Illumination" means radiant energy evaluated according to its capacity to produce visual sensation.

(3) "Nonionizing radiation" as related to industrial sources, means electromagnetic radiation within the spectral range of approximately 200 nanometers to 3 kilometers including ultraviolet, visible, infrared and radiofrequency/microwave radiation. The electromagnetic spectrum is shown graphically in Figure 1 below.

ELECTROMAGNETIC SPECTRUM
Figure 1



(4) Pressure is a barometric force. Positive pressure would be that above 14.7 lbs. per square inch absolute and negative pressure would be that below 14.7 lbs. per square inch absolute. 14.7 lbs. per square inch equals 760 mm. mercury.

(5) "Vibration" means rapid movement to and fro or oscillating movement.

(6) "Noise" means unwanted sound or loud discordant or disagreeable sound or sounds.

(7) "Temperature" means the degree of hotness or coldness measured by use of a thermometer.

(8) "Radiant heat" means infrared radiation emitted from hot surfaces.

(9) "Relative humidity" means the percent of moisture in the air compared to the maximum amount of moisture the air could contain at the same temperature.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-62-09001, filed 12/11/84; Order 73-3, § 296-62-09001, filed 5/7/73.]

WAC 296-62-09003 Lighting and illumination. (1) Lighting which is adequately adjusted to provide a margin of safety for all work tasks shall be provided and maintained.

(a) The minimum level of task lighting for all indoor activities shall be an average of 10 foot candles measured 30 inches above the floor or at the task.

(b) The minimum level of task lighting for all outdoor activities shall be an average of five foot candles measured thirty inches above the working surface or at the task.

(2) If general lighting is not provided throughout the work area, the employer shall provide illumination which is adequately adjusted to provide visibility of nearby objects which might be potential hazards or to see to operate emergency control or other equipment. The minimum level of nontask lighting for all indoor and outdoor activities shall be an average of 3 foot candles measured 30 inches above the floor or working surface.

Note: This section establishes minimal levels of illumination for safety purposes only. Guidelines pertaining to optimal levels of lighting and illumination may be found in Practice for Industrial Lighting, ANSI/IES RP7-1979. The minimum levels specified in subsections (1) and (2) of this section represent averages with the lowest level in an area to be no less than fifty percent of the indicated value.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 83-24-013 (Order 83-34), § 296-62-09003, filed 11/30/83; 82-13-045 (Order 82-22), § 296-62-09003, filed 6/11/82; Order 76-6, § 296-62-09003, filed 3/1/76; Order 73-3, § 296-62-09003, filed 5/7/73.]

WAC 296-62-09004 Ionizing radiation. (1) Definitions applicable to this section.

Note: Definitions also appear in some subsections.

(a) "Radiation" includes alpha rays, beta rays, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but such term does not include sound or radio waves, or visible light, or infrared or ultraviolet light.

(b) "Radioactive material" means any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.

(c) "Restricted area" means any area access to which is controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

(d) "Unrestricted area" means any area access to which is not controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

(e) "Dose" means the quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body. When the provisions in this section specify a dose during a period of time, the dose is the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time. Several different units of dose are in current use. Definitions of units used in this section are set forth in subdivisions (f) and (g) of this subsection.

(f) "Rad" means a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit of mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue (1 millirad (mrad) = 0.001 rad).

(g) "Rem" means a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen (r) of x-rays (1 millirem (mrem) = 0.001 rem). The relation of the rem to other dose units depends upon the biological effect under consideration and upon the conditions for irradiation. Each of the following is considered to be equivalent to a dose of 1 rem:

- (i) A dose of 1 roentgen due to x- or gamma radiation;
- (ii) A dose of 1 rad due to x-, gamma, or beta radiation;
- (iii) A dose of 0.1 rad due to neutrons or high energy protons;
- (iv) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye;

(v) If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, as provided in item (iii) of this subdivision, 1 rem of neutron radiation may, for purposes of the provisions in this section be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there is sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to 1 rem may be estimated from the following table:

Neutron Flux Dose Equivalents		
Neutron energy (million electron volts (Mev))	Number of neutrons per square centimeter equivalent to a dose of 1 rem (neutrons/cm ²)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm ² per sec.)
Thermal	970 X 10 ⁶	670
0.0001	720 X 10 ⁶	500
0.005	820 X 10 ⁶	570
0.02	400 X 10 ⁶	280
0.1	120 X 10 ⁶	80
0.5	43 X 10 ⁶	30
1.0	26 X 10 ⁶	18
2.5	29 X 10 ⁶	20
5.0	26 X 10 ⁶	18
7.5	24 X 10 ⁶	17
10	24 X 10 ⁶	17
10 to 30	14 X 10 ⁶	10

(h) For determining exposures to x- or gamma rays up to 3 Mev., the dose limits specified in this section may be assumed to be equivalent to the "air dose." For the purpose of this section "air dose" means that the dose is measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dosage rate.

(i) "Curie" means a unit of measurement of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 2.2 x 10¹² disintegrations per minute (dpm).

- (i) One millicurie (mCi) = 10⁻³Ci
- (ii) One microcurie (uCi) = 10⁻⁶Ci
- (iii) One nanocurie (nCi) = 10⁻⁹Ci
- (iv) One picocurie (pCi) = 10⁻¹²Ci

(2) Nuclear Regulatory Commission licensees—NRC contractors operating NRC plants and facilities.

(a) Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended, under a license issued by the Nuclear Regulatory Commission and in accordance with the requirements of chapter 402-24 WAC shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.

(b) NRC contractors operating NRC plants and facilities: Any employer who possesses or uses source material, byproduct material, special nuclear material, or other radiation sources under a contract with the Nuclear Regulatory Commission for the operation of NRC plants and facilities and in accordance with the standards, procedures, and other requirements for radiation protection established by the commission for such contract pursuant to the Atomic Energy Act of 1954 as amended (42 U.S.C. 2011 et seq.) shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.

(c) State licensees or registrants:

(i) Atomic Energy Act sources. Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has registered such sources with the state shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned.

(ii) Other sources. Any employer who possesses or uses radiation sources other than source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has registered such sources with the state shall be deemed to be in compliance with the radiation requirements of this section insofar as his possession and use of such material is concerned.

(3) Exposure of individuals to radiation in restricted areas.

(a) Except as provided in subdivision (b) of this subsection, no employer shall possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified in the following table:

EXPOSURE IN RESTRICTED AREAS	Rems per Calendar Quarter
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads	1 1/4
Hand and forearms; feet and ankles	18 3/4
Skin of whole body	7 1/2

(b) An employer may permit an individual in a restricted area to receive doses to the whole body greater than those permitted under subdivision (a) of this subsection, so long as:

(i) During any calendar quarter the dose to the whole body shall not exceed 3 rems; and

(ii) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not

exceed 5 (N-18) rems, where "N" equals the individual's age in years at his last birthday; and

(iii) The employer maintains adequate past and current exposure records which show that the addition of such a dose will not cause the individual to exceed the amount authorized in this subdivision. As used in this subdivision "Dose to the whole body" shall be deemed to include any dose to the whole body, gonad, active blood-forming organs, head and trunk, or lens of the eye.

(c) No employer shall permit any employee who is under 18 years of age to receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in the preceding table entitled "exposure in restricted areas."

(d) "Calendar quarter" means any 3-month period determined as follows:

(i) The first period of any year may begin on any date in January: Provided, That the second, third and fourth periods accordingly begin on the same date in April, July, and October, respectively, and that the fourth period extends into January of the succeeding year, if necessary to complete a 3-month quarter. During the first year of use of this method of determination, the first period for that year shall also include any additional days in January preceding the starting date for the first period; or

(ii) The first period in a calendar year of 13 complete, consecutive calendar weeks; the second period in a calendar year of 13 complete consecutive weeks; the third period in a calendar year of 13 complete, consecutive calendar weeks; the fourth period in a calendar year of 13 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included within the last complete calendar week of that year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included within the last complete calendar week of the previous year; or

(iii) The four periods in a calendar year may consist of the first 14 complete, consecutive calendar weeks; the next 12 complete, consecutive calendar weeks, the next 14 complete, consecutive calendar weeks, and the last 12 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included (for purposes of this section) within the last complete calendar week of the year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included (for purposes of this section) within the last complete week of the previous year.

(e) No employer shall change the method used by him to determine calendar quarters except at the beginning of a calendar year.

(4) Exposure to airborne radioactive material.

(a) No employer shall possess, use or transport radioactive material in such a manner as to cause any employee, within a restricted area, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table I of WAC 402-24-220, Appendix A. The limits given in Table I are for exposure to the concentrations specified for 40 hours in any workweek of 7 consecutive days. In any such period where the number of hours of expo-

sure is less than 40 the limits specified in the table may be increased proportionately. In any such period where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.

(b) No employer shall possess, use, or transfer radioactive material in such a manner as to cause any individual within a restricted area, who is under 18 years of age, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table II of WAC 402-24-220, Appendix A.

For purposes of this subdivision, concentrations may be averaged over periods not greater than 1 week.

(c) "Exposed" as used in this subdivision means that the individual is present in an airborne concentration. No allowance shall be made for the use of protective clothing or equipment, or particle size.

(5) Precautionary procedures and personal monitoring.

(a) Every employer shall make such surveys as may be necessary for him to comply with the provisions in this section. "Survey" means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.

(b) Every employer shall supply appropriate personnel monitoring equipment, such as film badges, pocket chambers, pocket dosimeters, or film rings, to, and shall require the use of such equipment by:

(i) Each employee who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in subsection (3)(a) of this section; and

(ii) Each employee under 18 years of age who enters a restricted area under such circumstances that he receives, or is likely to receive a dose in any calendar quarter in excess of 5 percent of the applicable value specified in subsection (3)(a) of this section; and

(iii) Each employee who enters a high radiation area.

(c) As used in this section:

(i) "Personnel monitoring equipment" means devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e.g., film badges, pocket chambers, pocket dosimeters, film rings, etc.);

(ii) "Radiation area" means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirem; and

(iii) "High radiation area" means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

(6) Caution signs, labels and signals.

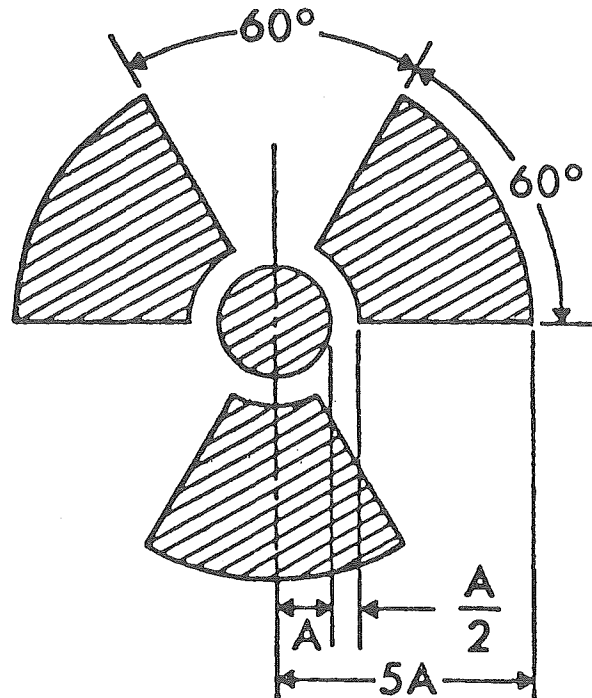
(a) General.

(i) Symbols prescribed by this subsection shall use the conventional radiation caution colors (magenta or purple on

yellow background). The symbol prescribed by this subsection is the conventional three-bladed design:

RADIATION SYMBOL

1. Cross-hatched area is to be magenta or purple.
2. Background is to be yellow.



(ii) In addition to the contents of signs and labels prescribed in this subsection, employers may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation or to radioactive material.

(b) Radiation area. Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subdivision (a) of this subsection and the words:

CAUTION
RADIATION AREA

(c) High radiation area.

(i) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION
HIGH RADIATION AREA

(ii) Each high radiation area shall be equipped with a control device which shall either cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in 1 hour upon entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the employer or a supervisor of the activity are made aware of the

entry. In the case of a high radiation area established for a period of 30 days or less, such control device is not required.

(d) Airborne radioactivity area.

(i) As used in the provisions of this section, "airborne radioactivity area" means:

(A) Any room, enclosure, or operating area in which airborne radioactive materials, composed wholly or partly of radioactive material, exist in concentrations in excess of the amounts specified in column 1 of Table I of WAC 402-24-220, Appendix A.

(B) Any room, enclosure, or operating area in which airborne radioactive materials exist in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed 25 percent of the amounts specified in column 1 of Table I of WAC 402-24-220, Appendix A.

(ii) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subdivision (a) of this subsection and the words:

CAUTION
AIRBORNE RADIOACTIVITY AREA

(e) Additional requirements.

(i) Each area or room in which radioactive material is used or stored and which contains any radioactive material (other than natural uranium or thorium) in any amount exceeding 10 times the quantity of such material specified in WAC 402-24-230, Appendix B shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subdivision (a) of this subsection and the words:

CAUTION
RADIOACTIVE MATERIALS

(ii) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity of such material specified in chapter 402-24 WAC shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subdivision (a) of this subsection and the words:

CAUTION
RADIOACTIVE MATERIALS

(f) Containers.

(i) Each container in which is transported, stored, or used a quantity of any radioactive material (other than natural uranium or thorium) greater than the quantity of such material specified in WAC 402-24-230, Appendix B shall bear a durable, clearly visible label bearing the radiation caution symbol described in subdivision (a) of this subsection and the words:

CAUTION
RADIOACTIVE MATERIALS

(ii) Each container in which natural uranium or thorium is transported, stored, or used in a quantity greater than 10 times the quantity specified in WAC 402-24-230, Appendix B shall bear a durable, clearly visible label bearing the radiation

caution symbol described in subdivision (a) of this subsection and the words:

CAUTION
RADIOACTIVE MATERIALS

(iii) Notwithstanding the provisions of items (i) and (ii) of this subdivision a label shall not be required:

(A) If the concentration of the material in the container does not exceed that specified in column 2 of Table I of WAC 402-24-220, Appendix A.

(B) For laboratory containers, such as beakers, flasks, and test tubes, used transiently in laboratory procedures, when the user is present.

(iv) Where containers are used for storage, the labels required in this subdivision shall state also the quantities and kinds of radioactive materials in the containers and the date of measurement of the quantities.

(7) Immediate evacuation warning signal.

(a) Signal characteristics.

(i) The signal shall be a midfrequency complex sound wave amplitude modulated at a subsonic frequency. The complex sound wave in free space shall have a fundamental frequency f^1 between 450 and 500 hertz (Hz) modulated at a subsonic rate between 4 and 5 hertz.

(ii) The signal generator shall not be less than 75 decibels at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

(iii) A sufficient number of signal units shall be installed such that the requirements of item (i) of this subdivision are met at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

(iv) The signal shall be unique in the plant or facility in which it is installed.

(v) The minimum duration of the signal shall be sufficient to insure that all affected persons hear the signal.

(vi) The signal-generating system shall respond automatically to an initiating event without requiring any human action to sound the signal.

(b) Design objectives.

(i) The signal-generating system shall be designed to incorporate components which enable the system to produce the desired signal each time it is activated within one-half second of activation.

(ii) The signal-generating system shall be provided with an automatically activated secondary power supply which is adequate to simultaneously power all emergency equipment to which it is connected, if operation during power failure is necessary, except in those systems using batteries as the primary source of power.

(iii) All components of the signal-generating system shall be located to provide maximum practicable protection against damage in case of fire, explosion, corrosive atmosphere, or other environmental extremes consistent with adequate system performance.

(iv) The signal-generating system shall be designed with the minimum number of components necessary to make it function as intended, and should utilize components which do not require frequent servicing such as lubrication or cleaning.

(v) Where several activating devices feed activating information to a central signal generator, failure of any activating device shall not render the signal-generator system inoperable to activating information from the remaining devices.

(vi) The signal-generating system shall be designed to enhance the probability that alarm occurs only when immediate evacuation is warranted. The number of false alarms shall not be so great that the signal will come to be disregarded and shall be low enough to minimize personal injuries or excessive property damage that might result from such evacuation.

(c) Testing.

(i) Initial tests, inspections, and checks of the signal-generating system shall be made to verify that the fabrication and installation were made in accordance with design plans and specifications and to develop a thorough knowledge of the performance of the system and all components under normal and hostile conditions.

(ii) Once the system has been placed in service, periodic tests, inspections, and checks shall be made to minimize the possibility of malfunction.

(iii) Following significant alterations or revisions to the system, tests and checks similar to the initial installation tests shall be made.

(iv) Tests shall be designed to minimize hazards while conducting the tests.

(v) Prior to normal operation the signal-generating system shall be checked physically and functionally to assure reliability and to demonstrate accuracy and performance. Specific tests shall include:

(A) All power sources.

(B) Calibration and calibration stability.

(C) Trip levels and stability.

(D) Continuity of function with loss and return of required services such as AC or DC power, air pressure, etc.

(E) All indicators.

(F) Trouble indicator circuits and signals, where used.

(G) Air pressure (if used).

(H) Determine that sound level of the signal is within the limit of item (a)(ii) of this subsection at all points that require immediate evacuation.

(vi) In addition to the initial startup and operating tests, periodic scheduled performance tests and status checks must be made to insure that the system is at all times operating within design limits and capable of the required response. Specific periodic tests or checks or both shall include:

(A) Adequacy of signal activation device.

(B) All power sources.

(C) Function of all alarm circuits and trouble indicator circuits including trip levels.

(D) Air pressure (if used).

(E) Function of entire system including operation without power where required.

(F) Complete operational tests including sounding of the signal and determination that sound levels are adequate.

(vii) Periodic tests shall be scheduled on the basis of need, experience, difficulty, and disruption of operations. The entire system should be operationally tested at least quarterly.

(viii) All employees whose work may necessitate their presence in an area covered by the signal shall be made familiar with the actual sound of the signal—preferably as it sounds at their work location. Before placing the system into operation, all employees normally working in the area shall be made acquainted with the signal by actual demonstration at their work locations.

(8) Exceptions from posting requirements. Notwithstanding the provisions of subsection (6) of this section:

(a) A room or area is not required to be posted with a caution sign because of the presence of a sealed source, provided the radiation level 12 inches from the surface of the source container or housing does not exceed 5 millirem per hour.

(b) Rooms or other areas in onsite medical facilities are not required to be posted with caution signs because of the presence of patients containing radioactive material, provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the provisions of this section.

(c) Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than 8 hours: Provided, That

(i) The materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the provisions of this section; and

(ii) Such area or room is subject to the employer's control.

(9) Exemptions for radioactive materials packaged for shipment. Radioactive materials packaged and labeled in accordance with regulations of the Department of Transportation published in 49 CFR Chapter I, are exempt from the labeling and posting requirements of this section during shipment, provided that the inside containers are labeled in accordance with the provisions of subsection (6) of this section.

(10) Instruction of personnel, posting.

(a) Employers regulated by the Nuclear Regulatory Commission shall be governed by 10 CFR Part 20 standards. Employers conducting business in Washington state shall be governed by the requirements of the laws and regulations of the state. All other employers shall be regulated by the following:

(b) All individuals working in or frequenting any portion of a radiation area shall be informed of the occurrence of radioactive materials or of radiation in such portions of the radiation area; shall be instructed in the safety problems associated with exposure to such materials or radiation and in precautions or devices to minimize exposure; shall be instructed in the applicable provisions of this section for the protection of employees from exposure to radiation or radioactive materials; and shall be advised of reports of radiation exposure which employees may request pursuant to the regulations in this section.

(c) Each employer to whom this section applies shall post a current copy of its provisions and a copy of the operating procedures applicable to the work conspicuously in such locations as to insure that employees working in or frequent-

ing radiation areas will observe these documents on the way to and from their place of employment, or shall keep such documents available for examination of employees upon request.

(11) Storage of radioactive materials. Radioactive materials stored in a nonradiation area shall be secured against unauthorized removal from the place of storage.

(12) Waste disposal. No employer shall dispose of radioactive material except as provided for in WAC 402-24-130.

(13) Notification of incidents.

(a) Immediate notification. Each employer shall immediately notify the industrial hygiene section, division of industrial safety and health for employees not protected by the Nuclear Regulatory Commission by means of 10 CFR Part 20; subsection (2)(b) of this section by telephone or telegraph of any incident involving radiation which may have caused or threatens to cause:

(i) Exposure of the whole body of any individual to 25 rems or more of radiation; exposure of the skin of the whole body of any individual to 150 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms of any individual to 375 rems or more of radiation; or

(ii) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limit specified for such materials in Table II of WAC 402-24-220, Appendix A.

(iii) A loss of 1 working week or more of the operation of any facilities affected; or

(iv) Damage to property in excess of \$100,000.

(b) Twenty-four hour notification. Each employer shall within 24 hours following its occurrence notify the industrial hygiene section, division of industrial safety and health, for employees not protected by the Nuclear Regulatory Commission by means of 10 CFR Part 20; subsection (2)(b) of this section, by telephone or telegraph of any incident involving radiation which may have caused or threatens to cause:

(i) Exposure of the whole body of any individual to 5 rems or more of radiation; exposure of the skin of the whole body of any individual to 30 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms to 75 rems or more of radiation; or

(ii) A loss of 1 day or more of the operation of any facilities; or

(iii) Damage to property in excess of \$10,000.

(14) Reports of overexposure and excessive levels and concentrations.

(a) In addition to any notification required by subsection (13) of this section each employer shall make a report in writing within 30 days to the industrial hygiene section division of industrial safety and health, for employees not protected by the Nuclear Regulatory Commission by means of 10 CFR Part 20; or under subsection (2)(b) of this section, of each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit in this section. Each report required under this subdivision shall describe the extent of exposure of persons to radiation or to radioactive material; levels of radiation and concentration of radioactive material involved, the cause of the exposure, levels of concentrations; and corrective steps taken or planned to assure against a recurrence.

(b) In any case where an employer is required pursuant to the provisions of this subsection to report to the industrial hygiene section, division of industrial safety and health, any exposure of an individual to radiation or to concentrations of radioactive material, the employer shall also notify such individual of the nature and extent of exposure. Such notice shall be in writing and shall contain the following statement: "You should preserve this report for future reference."

(15) Records.

(a) Every employer shall maintain records of the radiation exposure of all employees for whom personnel monitoring is required under subsection (5) of this section and advise each of his employees of his individual exposure on at least an annual basis.

(b) Every employer shall maintain records in the same units used in tables in subsection (2) of this section and WAC 402-24-220, Appendix A.

(16) Disclosure to former employee of individual employee's record.

(a) At the request of a former employee an employer shall furnish to the employee a report of the employee's exposure to radiation as shown in records maintained by the employer pursuant to subdivision (15)(a) of this section. Such report shall be furnished within 30 days from the time the request is made, and shall cover each calendar quarter of the individual's employment involving exposure to radiation or such lesser period as may be requested by the employee. The report shall also include the results of any calculations and analysis of radioactive material deposited in the body of the employee. The report shall be in writing and contain the following statement: "You should preserve this report for future reference."

(b) The former employee's request should include appropriate identifying data, such as social security number and dates and locations of employment.

(17) (Reserved)

(18) Radiation standards for mining.

(a) For the purpose of this subsection, a "working level" is defined as any combination of radon daughters in 1 liter of air which will result in the ultimate emission of 1.3×10^5 million electron volts of potential alpha energy. The numerical value of the "working level" is derived from the alpha energy released by the total decay of short-lived radon daughter products in equilibrium with 100 picocuries of radon 222 per liter of air. A working level month is defined as the exposure received by a worker breathing air at one working level concentration for 4-1/3 weeks of 40 hours each.

(b) Occupational exposure to radon daughters in mines shall be controlled so that no individual will receive an exposure of more than 2 working level months in any calendar quarter and no more than 4 working level months in any calendar year. Actual exposures shall be kept as far below these values as practicable.

(c)(i) For uranium mines, records of environmental concentrations in the occupied parts of the mine, and of the time spent in each area by each person involved in an underground work shall be established and maintained. These records shall be in sufficient detail to permit calculations of the exposures, in units of working level months, of the individuals and shall be available for inspection by the industrial hygiene section,

division of safety and health or their authorized representatives.

(ii) For other than uranium mines and for surface workers in all mines, item (i) of this subdivision will be applicable: Provided, however, That if no environmental sample shows a concentration greater than 0.33 working level in any occupancy part of the mine, the maintenance of individual occupancy records and the calculation of individual exposures will not be required.

(d)(i) At the request of an employee (or former employee) a report of the employee's exposure to radiation as shown in records maintained by the employer pursuant to subdivision (c) of this subsection shall be furnished to him. The report shall be in writing and contain the following statement:

"This report is furnished to you under the provisions of the state of Washington, Ionizing Radiation Safety and Health Standards (chapter 296-62 WAC). You should preserve this report for future reference."

(ii) The former employee's request should include appropriate identifying data, such as Social Security number and dates and locations of employment. See tables in WAC 402-24-220, Appendix A and 402-24-230, Appendix B.

[Statutory Authority: RCW 49.17.040 and 49.17.050, 85-01-022 (Order 84-24), § 296-62-09004, filed 12/11/84; Order 75-15, § 296-62-09004, filed 4/18/75.]

WAC 296-62-09005 Nonionizing radiation. (1) Introduction. Employees shall be protected from exposure to hazardous levels of nonionizing radiation. Health standards have been established for ultraviolet, radiofrequency/microwave, and laser radiations which shall be used to promote a healthful working environment. These standards refer to levels of nonionizing radiation and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effects. They are based on the best available information from experimental studies. Because of the wide variations in individual susceptibility, exposure of an occasional individual at, or even below, the permissible limit, may result in discomfort, aggravation of a preexisting condition, or physiological damage.

(a) Permissible exposure limits (PELs) refer to a time weighted average (TWA) of exposure for an 8-hour work day within a 40-hour workweek. Exceptions are those limits which are given a ceiling value.

(b) These PELs should be interpreted and applied only by technically qualified persons.

(c) Ceiling value. There are nonionizing radiations which produce physiological responses from short intense exposure and the PELs for these radiations are more appropriately based on this particular hazard. Nonionizing radiations with this type of hazard are best controlled by a ceiling value which is a maximum level of exposure which shall not be exceeded.

(2) The employer shall establish and maintain a program for the control and monitoring of nonionizing radiation hazards. This program shall provide employees adequate supervision, training, facilities, equipment, and supplies, for the control and assessment of nonionizing radiation hazards.

[Title 296 WAC—p. 1734]

(3) Radiofrequency/microwave radiation permissible exposure limits.

(a) Definition: "Partial body exposure" means the case in which only the hands and forearms or the feet and legs below the knee are exposed.

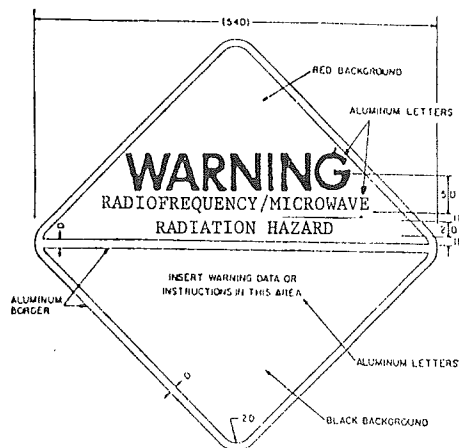
(b) Warning symbol.

(i) The warning symbol for radiofrequency/microwave radiation shall consist of a red isosceles triangle above an inverted black isosceles triangle, separated and outlined by an aluminum color border. The words "Warning - Radiofrequency/microwave radiation hazard" shall appear in the upper triangle. See Figure 1.

(ii) All areas where entry may result in an exposure to radiofrequency/microwave radiation in excess of the PEL shall have a warning symbol prominently displayed at their entrance.

(iii) American National Standard Safety Color Code for Marking Physical Hazards and the Identification of Certain Equipment, Z53.1-1953, shall be used for color specification. All lettering and the border shall be of aluminum color.

(iv) The inclusion and choice of warning information or precautionary instructions is at the discretion of the user. If such information is included it shall appear in the lower triangle of the warning symbol.



1. Place handling and mounting instructions on reverse side.
2. D = Scaling Unit.
3. Lettering: Ratio of letter height to thickness of letter lines.

Upper triangle:	5 to 1 Large
	6 to 1 Medium
Lower triangle:	4 to 1 Small
	6 to 1 Medium
4. Symbol is square, triangles are right-angle isosceles.

Figure 1

Radiofrequency/Microwave Radiation Hazard Warning Symbol

1. Cross-hatched area is to be magenta or purple.
2. Background is to be yellow.

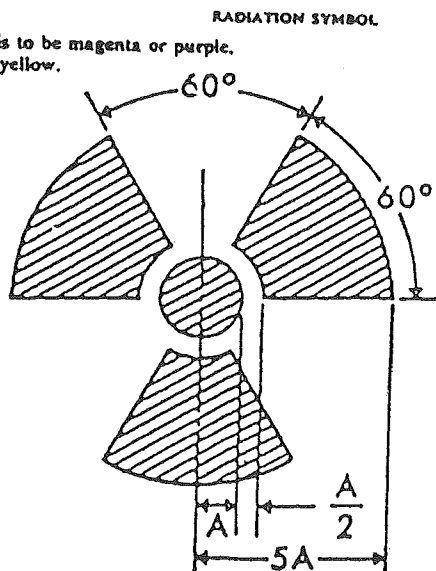


FIGURE G-10

(c) These PELs refer to radiofrequency/microwave radiation exposures in the frequency range of 300 kHz to 100 GHz. Based on current knowledge, it is believed that workers may be exposed at these PELs without adverse health effects.

(i) Table I gives the PELs in terms of the mean squared electric (E^2) and magnetic (H^2) field strengths and in terms of the equivalent plane-wave free-space power density, as a function of frequency.

(ii) The average exposure for any 6 minute (0.1 hour) period shall not exceed the PEL.

(iii) Measurements shall be made at distances of 5 cm or greater from any object.

(iv) For mixed or broadband fields at a number of frequencies for which there are different PELs, the fraction of the PEL incurred within each frequency interval shall be determined and the sum of these fractions shall not exceed unity.

(v) PELs given in Table I for frequencies between 300 kHz and 1 GHz may be exceeded for partial body exposures if the output power of the radiating device is 7 watts or less.

Table I. Radiofrequency/Microwave Radiation Permissible Exposure Limits (PELs).

Frequency(f)	Power Density*	Electric Field Strength Squared*	Magnetic Field Strength Squared*
	mW/cm ²	V ² /m ²	A ² /m ²
0.3 to 3 MHz	100	400,000	2.5
3 to 30 MHz	900/f ²	4000(900/f ²)	0.025(900/f ²)
30 to 300 MHz	1.0	4000	0.025
300 to 1500 MHz	f/300	4000(f/300)	0.025(f/300)
1.5 to 100 GHz	5.0	20,000	0.125

Note: f=frequency (MHz)

*Ceiling value

(4) Laser radiation permissible exposure limits.

(a) Definitions.

(i) "Diffuse reflection" means a change of the spatial distribution of a beam of radiation when it is reflected in many directions by a surface or medium.

(ii) "Specular reflection" means a mirrorlike reflection.

(iii) "Accessible radiation" means laser radiation to which human access is possible.

(b) All lasers and laser systems shall be classified in accordance with the Federal Laser Product Performance Standards (21 CFR 1040.10) or, if manufactured prior to August 2, 1976, in accordance with ANSI Z136.1-1980.

(i) Class I. Laser systems that are considered to be incapable of producing damaging radiation levels and are thereby exempt from control measures. This is a no hazard category.

(ii) Class II. Visible wavelength laser systems that have a low hazard potential because of the expected aversion response. There is some possibility of injury if stared at. This is a low hazard category.

(iii) Class III. Laser systems in which intrabeam viewing of the direct beam or specular reflections of the beam may be hazardous. This class is further subdivided into IIIa and IIIb. This is a moderate hazard category.

(iv) Class IV. Laser systems whose direct or diffusely reflected radiation may be hazardous and where the beam may constitute a fire hazard. Class IV systems require the use of controls that prevent exposure of the eye and skin to specular or diffuse reflections of the beam. This is a high hazard category.

(c) Warning signs and classification labels shall be prepared in accordance with 21 CFR 1040.10 when classifying lasers and laser systems, and ANSI Z136.1 - 1980 when using classified lasers and laser systems. All signs and labels shall be conspicuously displayed.

(i) The signal word "CAUTION" shall be used with all signs and labels associated with Class II and Class IIIa lasers and laser systems.

(ii) The signal word "DANGER" shall be used with all signs and labels associated with Class IIIb and Class IV lasers and laser systems.

(d) Personal protective equipment shall be provided at no cost to the employee and shall be worn whenever operational conditions or maintenance of lasers may result in a potentially hazardous exposure.

(i) Protective eyewear shall be specifically designed for protection against radiation of the wavelength and radiant energy of the laser or laser system. Ocular exposure shall not exceed the recommendations of ANSI Z136.1 - 1980.

(ii) For Class IV lasers and laser systems protective eyewear shall be worn for all operational conditions or maintenance which may result in exposures to laser radiation.

(e) Engineering controls shall be used whenever feasible to reduce the accessible radiation levels for Class IV lasers and laser systems to a lower classification level. These controls may include, but are not limited to: Protective housings, interlocks, optical system attenuators, enclosed beam paths, remote controls, beam stops, and emission delays with audible warnings.

(f) All employees who may be exposed to laser radiation shall receive laser safety training. The training shall ensure that the employees are knowledgeable of the potential hazards and control measures for the laser equipment in use.

(5) Ultraviolet radiation.

(a) These permissible exposure limits refer to ultraviolet radiation in the spectral region between 200 and 400 nanometer (nm) and represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect. These values for exposure of the eye or the skin apply to ultraviolet radiation from arcs, gas, and vapor discharges, and incandescent sources, but do not apply to ultraviolet lasers or solar radiation. These levels should not be used for determining exposure of photosensitive individuals to ultraviolet radiation. These values shall be used in the control of exposure to continuous sources where the exposure relation shall not be less than 0.1 sec.

(b) The permissible exposure limit for occupational exposure to ultraviolet radiation incident upon skin or eye where irradiance values are known and exposure time is controlled are as follows:

(i) For the near ultraviolet spectral region (320 to 400 nanometer (nm)), total irradiance incident upon the unprotected skin or eye shall not exceed 1.0 milliwatt/sq. centimeter for periods greater than 10³ seconds (approximately 16 minutes) and for exposure times less than 10₃ seconds shall not exceed one Joule/sq. centimeter.

(ii) For the actinic ultraviolet spectral region (200 - 315 nm), radiant exposure incident upon the unprotected skin or eye shall not exceed the values given in Table 4 within an 8-hour period.

(iii) To determine the effective irradiance of a broadband source weighted against the peak of the spectral effectiveness curve (270 nanometer (nm)), the following weighting formulas shall be used.

$$E_{\text{eff}} = \sum (E\text{-Lambda}) (S\text{-Lambda}) (\Delta\text{-Lambda})$$

Where:

- E_{eff} = effective irradiance relative to a monochromatic source at 270nm
- E-Lambda = spectral irradiance in Watts/sq. centimeter/nanometer.
- S-Lambda = relative spectral effectiveness (unitless)
- Delta-Lambda = band width in nanometers

(iv) Permissible exposure time in seconds for exposure to actinic ultraviolet radiation incident upon the unprotected skin or eye may be computed by dividing 0.003 Joules/sq. centimeter by E_{eff} in Watts/sq. centimeter. The exposure time may also be determined using Table 5 which provides exposure times corresponding to effective irradiances in $\mu\text{W}/\text{cm}^2$.

TABLE 4

Wavelength nanometer	PEL millijoules/sq. centimeters	Relative Spectral Effectiveness S Lambda
200	100	0.03
210	40	0.075
220	25	0.12
230	16	0.19
240	10	0.30
250	7.0	0.43
254	6.0	0.5

Wavelength nanometer	PEL millijoules/sq. centimeters	Relative Spectral Effectiveness S Lambda
260	4.6	0.65
270	3.0	1.0
280	3.4	0.88
290	4.7	0.64
300	10	0.30
305	50	0.06
310	200	0.015
315	1000	0.003

TABLE 5

Duration of Exposure Per Day	Effective Irradiance E_{eff} ($\mu\text{W}/\text{cm}^2$)
8 hrs.	0.1
4 hrs.	0.2
2 hrs.	0.4
1 hr.	0.8
1/2 hr.	1.7
15 min.	3.3
10 min.	5
5 min.	10
1 min.	50
30 sec.	100
10 sec.	300
1 sec.	3,000
0.5 sec.	6,000
0.1 sec.	30,000

TABLE 6

Densities and Transmissions (in Percent); also Tolerances in Densities and Transmissions of Various Shades of Glasses for Protection Against Injurious Rays (Shades 3 to 8, inclusive, are for use in goggles, shades 10 to 14, inclusive, for welder's helmets and face shields) [CODIFICATION NOTE: The graphic presentation of this table has been varied slightly in order that it would fall within the printing specifications for the Washington Administrative Code. In the following table, the original table had columns relating to (1) "Optical Density" which is now "Part 1," (2) "Total Visible Luminous Transmittance" and "Maximum total Infrared" which are now "Part 2," (3) "Maximum Ultraviolet Transmission" which is now "Part 3," and (4) "Recommended Uses" which is now "Part 4." These columns were all positioned side by side. In the new WAC format these are split up into four separate tables.]

TABLE 6—Part 1

Shade No.	Optical Density		
	Minimum [C]O.D.	Standard O.D.	Maximum O.D.
3.0	.64	.857	1.06
4.0	1.07	1.286	1.49
5.0	1.50	1.714	1.92
6.0	1.93	2.143	2.35
7.0	2.36	2.572	2.78
8	2.79	3.000	3.21
9	3.22	3.429	3.63
10	3.64	3.857	4.06
11	4.07	4.286	4.49
12	4.50	4.715	4.92
13	4.93	5.143	5.35
14	5.36	5.571	5.78

TABLE 6—Part 2

Shade No.	Total Visible Luminous Transmittance			Maximum Total Infrared %
	Maximum %	Standard %	Minimum %	
3.0	22.9	13.9	8.70	9.0
4.0	8.51	5.18	3.24	5.0
5.0	3.16	1.93	1.20	2.5
6.0	1.18	.72	.45	1.5
7.0	.44	.27	.17	1.3
8	.162	.100	.062	1.0
9	.060	.037	.023	.8
10	.0229	.0139	.0087	.6
11	.0085	.0052	.0033	.5
12	.0032	.0019	.0012	.5
13	.00118	.00072	.00045	.4
14	.00044	.00027	.00017	.3

TABLE 6—Part 3
Maximum Ultraviolet Transmission

Shade No.	313mu	334mu	365mu	405mu
	%	%	%	%
3.0	.2	.2	.5	1.0
4.0	.2	.2	.5	1.0
5.0	.2	.2	.2	.5
6.0	.1	.1	.1	.5
7.0	.1	.1	.1	.5
8	.1	.1	.1	.5
9	.1	.1	.1	.5
10	.1	.1	.1	.5
11	.05	.05	.05	.1
12	.05	.05	.05	.1
13	.05	.05	.05	.1
14	.05	.05	.05	.1

TABLE 6—Part 4

Shade No.	Recommended Uses
3.0	Glare of reflected sunlight from snow, water, sand, etc., stray light from cutting and welding metal pouring and work around furnaces and foundries.
4.0	
5.0	Light acetylene cutting and welding; light electric spot welding.
6.0	
7.0	Acetylene cutting and medium welding; arc welding up to 30 amperes.
8	
9	Heavy acetylene welding; arc cutting and welding between 30 and 75 amperes.
10	
11	Arc cutting and welding between 75 and 200 amperes.
12	
13	Arc cutting and welding between 200 and 400 amperes.
14	Arc cutting and welding above 400 amperes.

TABLE 6—Part 4

Shade No.	Recommended Uses
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- a. American Standard Safety Code for the Protection of Heads, Eyes, and Respiratory Organs.
- b. Standard density is defined as the logarithms (base 10) of the reciprocal of the transmission. Shade number is determined by the density according to the relations:

Shade number = 7/3 density + 1 with tolerances as given in the table.

Note: Safety glasses are available with lenses which protect the eyes against ultraviolet radiation.

[Statutory Authority: Chapter 49.17 RCW and RCW 49.17.040, [49.17].050 and [49.17].060. 92-22-067 (Order 92-06), § 296-62-09005, filed 10/30/92, effective 12/8/92. Statutory Authority: RCW 49.17.040 and 49.17.050. 85-01-022 (Order 84-24), § 296-62-09005, filed 12/11/84. Statutory Authority: RCW 49.17.040. 80-16-029 (Order 80-22), § 296-62-09005, filed 10/31/80. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 80-11-010 (Order 80-14), § 296-62-09005, filed 8/8/80; Order 73-3, § 296-62-09005, filed 5/7/73.]

Reviser's note: RCW 34.05.395 requires the use of underlining and deletion marks to indicate amendments to existing rules, and deems ineffectual changes not filed by the agency in this manner. The bracketed material in the above section does not appear to conform to the statutory requirement.

WAC 296-62-09007 Pressure. (1) Employees exposed to pressures above normal atmospheric pressure which may produce physiological injury shall adhere to decompression schedules or other tables as are or may be adopted by the department of labor and industries: for example, state of Washington "safety standards for compressed air work" and "safety standards for commercial diving operations." The employer shall provide and supervise the use of decompression equipment and schedules in accordance with applicable requirements.

(2) If no specific requirements prevail for an unusual condition, a plan based on the recommendations of professionally qualified advisors, experienced with hazards associated with such exposures, shall be followed by both the employer and employee.

[Statutory Authority: Chapter 49.17 RCW. 91-11-070 (Order 91-01), § 296-62-09007, filed 5/20/91, effective 6/20/91; Order 73-3, § 296-62-09007, filed 5/7/73.]

WAC 296-62-09009 Vibration. Reasonable precautions shall be taken to protect workmen against the hazardous effects of unavoidable exposure to vibrations.

[Order 73-3, § 296-62-09009, filed 5/7/73.]

WAC 296-62-09013 Temperature, radiant heat, or temperature-humidity combinations. (1) Workmen subjected to temperature extremes, radiant heat, humidity, or air velocity combinations which, over a period of time, are likely to produce physiological responses which are harmful shall be afforded protection by use of adequate controls, methods or procedures, or protective clothing. This shall not be construed to apply to normal occupations under atmospheric conditions which may be expected in the area except that special provisions which are required by other regulations for certain areas or occupations shall prevail.

[Order 73-3, § 296-62-09013, filed 5/7/73.]

PART K—HEARING CONSERVATION

WAC 296-62-09015 Hearing conservation. The employer shall administer a continuing effective hearing conservation program, as described in WAC 296-62-09015 through 296-62-09055 whenever employee noise exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 decibels (dB) measured on the A-scale weighting at slow response or, equivalently, a noise dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with WAC 296-62-09055, Appendix E: Noise exposure computation, without regard to any attenuation provided by the use of personal protective equipment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09015, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09015, filed 1/15/82.]

WAC 296-62-09017 Definitions. These definitions apply to the following terms as used in WAC 296-62-09015 through 296-62-09055.

(1) Audiogram - A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

(2) Audiologist - A professional, specializing in the study and rehabilitation of hearing, who is certified by the American Speech, Hearing, and Language Association or licensed by a state board of examiners.

(3) Baseline audiogram - The audiogram against which future audiograms are compared.

(4) Criterion sound level - A sound level of 90 decibels.

(5) Decibel (dB) - Unit of measurement of sound level.

(6) Hertz (Hz) - Unit of measurement of frequency, numerically equal to cycles per second.

(7) Impulsive or impact noise - Noise levels which involve maxima at intervals greater than one second. Where the intervals are less than one second, the noise levels shall be considered continuous.

(8) Medical pathology - A disorder or disease. For purposes of this regulation, a condition or disease affecting the ear, which should be treated by a physician specialist.

(9) Noise dose - The ratio, expressed as a percentage, of (a) the time integral, over a stated time or event, of the 0.6 power of the measured SLOW exponential time-averaged, squared A-weighted sound pressure and (b) the product of the criterion duration (8 hours) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).

(10) Noise dosimeter - An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

(11) Otolaryngologist - A physician specializing in diagnosis and treatment of disorders of the ear, nose and throat.

(12) Representative exposure - Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employer deems to be representative of the exposure of other employees in the workplace.

(13) Standard threshold shift - A hearing level change, relative to the baseline audiogram, of an average of 10 dB or more at 2000, 3000, and 4000 Hz in either ear.

(14) Sound level - Ten times the common logarithm of the ratio of the the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: Decibels (dB). For use with this regulation, SLOW time response, in accordance with ANSI S1.4-1971 (R1976), is required unless specifically specified otherwise.

(15) Sound level meter - An instrument for the measurement of sound level.

(16) Time-weighted average sound level - That sound level, which if constant over an 8-hour period, would result in the same noise dose as if measured in the time varying noise level environment.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09017, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09017, filed 1/15/82.]

WAC 296-62-09019 Monitoring. (1) When reasonable information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 dBA, the employer shall obtain individual or representative exposure measurements for all employees who may be exposed at or above that level.

(2) The sampling strategy shall be designed to identify all employees required to be included in the hearing conservation program and to enable the proper selection of hearing protectors.

(3) Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise exist, the employer shall use representative personal sampling to comply with the monitoring requirements of this section unless the employer can establish that area sampling produces equivalent results.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09019, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09019, filed 1/15/82.]

WAC 296-62-09021 Method of noise measurement.

(1) Noise dosimeters which comply, as a minimum, with the provisions of subdivision (1)(a) of this section or sound level meters which comply, as a minimum, with the provisions of subdivision (1)(b) of this section shall be used whenever employee exposures are evaluated for the purpose of complying with WAC 296-62-09015 through 296-62-09055.

(a) Dosimeters. Dosimeters shall meet the Class 2A-90/80-5 requirements of the American National Standard Specification for Personal Noise Dosimeters, S1.25-1978.

(b) Sound level meters. Sound level meters shall meet the Type 2 requirements of the American National Standard Specification for Sound Level Meters, S1.4-1971 (R1976).

(2) All continuous, intermittent, and impulsive sound levels from 80 dBA to 130 dBA shall be integrated into the exposure computation.

(3) Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

(a) Additional employees may be exposed at or above an 8-hour time-weighted average of 85 dBA; or

(b) The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of WAC 296-62-09033.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09021, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09021, filed 1/15/82.]

WAC 296-62-09023 Calibration of monitoring equipment. Dosimeters and sound level meters used to monitor employee noise exposure shall be calibrated using the instrument manufacturer's calibration instructions before and after each day's use.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09023, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09023, filed 1/15/82.]

WAC 296-62-09024 Employee notification. The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 dBA of the results of the monitoring.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09024, filed 11/30/83.]

WAC 296-62-09025 Observation of monitoring. The employer shall provide affected employees or their representatives with an opportunity to observe any measurements of employee noise exposure which are conducted pursuant to WAC 296-62-09019.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-09025, filed 1/15/82.]

WAC 296-62-09026 Noise control. (1) Whenever employee noise exposures equal or exceed an 8-hour time-weighted average of 90 dBA, feasible administrative or engineering controls shall be utilized.

(2) Upon request, the employer shall prepare and submit a written compliance plan to the director or his/her designee. This plan must include a description of the manner in which compliance will be achieved with respect to cited violations of WAC 296-62-09026(1) and shall include proposed abatement methods, anticipated completion dates, and provision for progress reports to the director or his/her designee.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09026, filed 11/30/83.]

WAC 296-62-09027 Audiometric testing program.

(1) The employer shall establish and maintain a mandatory audiometric testing program as provided in this section for all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 dBA.

(2) The program shall be provided at no cost to employees.

(3) Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other qualified physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or other qualified physician.

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(4) All audiograms obtained pursuant to this section shall meet the requirements of WAC 296-62-09047, Appendix A: Audiometric measuring instruments.

(5) Baseline audiogram.

(a) Prior to or within 180 days after an employee's first exposure to noise at or above a time-weighted average of 85 dBA, the employer shall establish for each employee so exposed a valid baseline audiogram against which subsequent audiograms can be compared. Employers who utilize mobile test units are allowed up to one year to obtain a valid baseline audiogram for each exposed employee, provided that each employee so exposed shall be trained and shall wear suitable hearing protectors in accordance with WAC 296-62-09015 through 296-62-09055.

(b) Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise.

This may be accomplished by use of hearing protectors; however, the employer shall notify employees of the need to avoid high levels of nonoccupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

(6) Annual audiogram.

(a) At least annually (i.e. every 12-month interval) after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above a time-weighted average of 85 dBA.

(b) Annual audiometric testing may be conducted at any time during the workshift.

(7) Evaluation of audiogram.

(a) Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if a standard threshold shift has occurred. This comparison may be made by a certified audiometric technician.

(b) If the annual audiogram indicates that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

(c) An audiologist, otolaryngologist or other qualified physician shall review audiograms which indicate a standard threshold shift to determine whether there is need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

(i) A copy of the requirements for hearing conservation as set forth in WAC 296-62-09015 through 296-62-09055;

(ii) The baseline audiogram and most recent audiogram of the employee to be evaluated;

(iii) Measurements of background sound pressure levels in the audiometric test room as required in WAC 296-62-09049, Appendix B: Audiometric test rooms; and

(iv) Records of audiometer calibrations required by WAC 296-62-09029(5).

(d) Inform each employee of the results of his/her audiometric test and whether or not there has been a hearing level decrease or improvement since his/her previous test.

(8) Follow-up procedures. If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employer shall ensure that the following steps are taken:

(a) Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

(b) Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.

(c) Inform the employee in writing, within 21 days of the determination, of the existence of a standard threshold shift;

(d) Refer the employee, at no cost to the employee, for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear (as defined in WAC 296-62-09017) is caused or aggravated by the wearing of hearing protectors; and

(e) Inform the employee of the need for an otological examination if a medical pathology of the ear which is unrelated to the use of hearing protectors is suspected.

(9) Revised baseline. An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or other qualified physician who is evaluating the audiogram:

(a) The standard threshold shift revealed by the audiogram is persistent; or

(b) The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09027, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09027, filed 1/15/82.]

WAC 296-62-09029 Audiometric test requirements.

(1) Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests at each frequency shall be taken separately for each ear.

(2) Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969(R1973).

(3) Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in WAC 296-62-09047, Appendix A: Audiometric measuring instruments.

(4) Audiometric examinations shall be administered in a room meeting the requirements listed in WAC 296-62-09049, Appendix B: Audiometric test rooms.

(5) Audiometer calibration.

(a) The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 dB or greater shall require an acoustic calibration.

(b) Audiometer calibration shall be checked acoustically at least annually in accordance with WAC 296-62-09051, Appendix C: Acoustic calibration of audiometers. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check.

(c) An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6-1969(R1973). Test frequencies below 500 Hz and above 6000 Hz may be omitted from the calibration.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09029, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09029, filed 1/15/82.]

WAC 296-62-09031 Hearing protectors. (1) Employers shall make hearing protectors available to all employees exposed to a time-weighted average of 85 dBA or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

(2) Employers shall ensure that hearing protectors are worn:

(a) By any employee who is exposed to an 8-hour time-weighted average of 85 dBA or greater; or

(b) By any employee who is exposed to noise above 115 dBA; or

(c) By any employee who is exposed to any impulsive or impact noise measured at or above 140 dB peak using an impulse sound level meter set to either the linear or C-scale.

(3) Employees shall be given the opportunity to select their hearing protectors from at least two different types (i.e. molded, self-molded, custom molded, or ear muffs) of suitable hearing protectors provided by the employer.

(4) The employer shall provide training in the use and care of all hearing protectors provided to employees.

(5) The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09031, filed 11/30/83; 82-13-045 (Order 82-22), § 296-62-09031, filed 6/11/82; 82-03-023 (Order 82-1), § 296-62-09031, filed 1/15/82.]

WAC 296-62-09033 Hearing protector attenuation.

(1) The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used by one of the methods described in WAC 296-62-09053, Appendix D: Methods for estimating the adequacy of hearing protector attenuation, or by other methods if approved by the director.

(2) Hearing protectors must attenuate employee exposure at least to a time-weighted average of 85 dBA or below.

(3) The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09033, filed 11/30/83; 82-13-045 (Order 82-22), § 296-62-09033, filed 6/11/82; 82-03-023 (Order 82-1), § 296-62-09033, filed 1/15/82.]

WAC 296-62-09035 Training program. (1) The employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time-weighted average of 85 dBA, and shall ensure employee participation in such program.

(2) The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

(3) The employer shall ensure that each employee is informed of the following:

- (a) The effects of noise on hearing;
- (b) The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and
- (c) The purpose of audiometric testing, and an explanation of the test procedures.

(d) The right to access to records as specified in WAC 296-62-09041(5).

(4) A written description of the training program instituted shall be maintained by each employer.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09035, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09035, filed 1/15/82.]

WAC 296-62-09037 Access to information and training materials. (1) The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

(2) The employer shall provide to affected employees any informational materials pertaining to this standard that are supplied to the employer by the director.

(3) The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the director.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-09037, filed 1/15/82.]

WAC 296-62-09039 Warning signs. (1) Signs shall be posted at entrances to or on the periphery of all well defined work areas in which employees may be exposed at or above 115 dBA.

(2) Warning signs shall clearly indicate that the area is a high noise area and that hearing protectors are required.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09039, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09039, filed 1/15/82.]

WAC 296-62-09041 Recordkeeping. (1) Exposure measurements. The employer shall maintain an accurate record of all employee exposure measurements required by this section.

(2) Audiometric tests.

(a) The employer shall retain a legible copy of all employee audiograms obtained pursuant to WAC 296-62-09027.

(b) This record shall include:

- (i) Name and job classification of the employee;
- (ii) Date of the audiogram;
- (iii) The examiner's name;
- (iv) Date of the last acoustic or exhaustive calibration of the audiometer; and
- (v) Employee's most recent noise exposure assessment.

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(3) Audiometric test rooms. The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

(4) Record retention. The employer shall retain records required in this section for at least the following periods:

(a) Noise exposure measurement records shall be retained for two years.

(b) Audiometric test records shall be retained for the duration of the affected employee's employment.

(5) Access to records. All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the director. The provisions of WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217 apply to access to records under this section.

(6) Transfer of records. If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in WAC 296-62-09041(4).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09041, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09041, filed 1/15/82.]

WAC 296-62-09043 Appendices. WAC 296-62-09047, 296-62-09049, 296-62-09051, and 296-62-09053 and 296-62-09055, Appendices A, B, C, D, and E are incorporated as part of this section and the contents of these appendices are mandatory.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09043, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09043, filed 1/15/82.]

WAC 296-62-09045 Effective dates. (1) WAC 296-62-09015 through 296-62-09053 shall become effective 60 days after filing with the code reviser, unless otherwise noted below.

(2) Monitoring conducted pursuant to WAC 296-62-09019 shall be completed no later than 180 days from the effective date of the standard.

(3) Baseline audiograms required by WAC 296-62-09027 shall be completed no later than December 31, 1982.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-09045, filed 1/15/82.]

WAC 296-62-09047 Appendix A—Audiometric measuring instruments. (1) In the event that pulsed-tone audiometers are used, they shall have a tone on-time of at least 200 milliseconds.

(2) Self-recording audiometers shall comply with the following requirements:

(a) The chart upon which the audiogram is traced shall have lines at positions corresponding to all multiples of 10 dB hearing level within the intensity range spanned by the audiometer. The lines shall be equally spaced and shall be separated by at least 1/4 inch. Additional increments are optional. The audiogram pen tracings shall not exceed 2 dB in width.

(b) It shall be possible to set the stylus manually at the 10dB increment lines for calibration purposes.

(c) The slewing rate for the audiometer attenuator shall not be more than 6 dB/sec except that an initial slewing rate greater than 6 dB/sec is permitted at the beginning of each new test frequency, but only until the second subject response.

(d) The audiometer shall remain at each required test frequency for 30 seconds (±3 seconds). The audiogram shall be clearly marked at each change of frequency and the actual frequency change of the audiometer shall not deviate from the frequency boundaries marked on the audiogram by more than ±3 seconds.

(e) It must be possible at each test frequency to place a horizontal line segment parallel to the time axis on the audiogram, such that the audiometric tracing crosses the line segment at least six times at the test frequency. At each test frequency the threshold shall be the average of the midpoints of the tracing excursions.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09047, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09047, filed 1/15/82.]

WAC 296-62-09049 Appendix B—Audiometric test rooms. Rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table B-1 when measured by equipment conforming at least to the Type 2 requirements of American National Standard Specification for Sound Level Meters, S1.4-1971 (R1976), and to the Class II requirements of American National Standard Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets, S1.11-1971 (R1976).

TABLE B-1 - Maximum Allowable Octave-Band Sound Pressure Levels for Audiometric Test Rooms.

Octave-band center frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level (dB)	40	40	47	57	62

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-03-023 (Order 82-1), § 296-62-09049, filed 1/15/82.]

WAC 296-62-09051 Appendix C—Acoustic calibration of audiometers. Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this Appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerance permitted by American National Standard Specifications for Audiometers, S3.6-1969 (R1973).

(1) Sound pressure output check.

(a) Place the earphone coupler over the microphone of the sound level meter and place the earphone on the coupler.

(b) Set the audiometer's hearing threshold level (HTL) dial to 70 dB.

(c) Measure the sound pressure level of the tones at each test frequency from 500 Hz through 6000 Hz for each earphone.

(d) At each frequency the readout on the sound level meter should correspond to the levels in Table C-1 or Table

C-2, as appropriate, for the type of earphone, in the column entitled "sound level meter reading."

(2) Linearity check.

(a) With the earphone in place, set the frequency to 1000 Hz and the HTL dial on the audiometer to 70 dB.

(b) Measure the sound levels in the coupler at each 10dB decrement from 70 dB to 10 dB, noting the sound level meter reading at each setting.

(c) For each 10dB decrement on the audiometer the sound level meter should indicate a corresponding 10 dB decrease.

(d) This measurement may be made electrically with a voltmeter connected to the earphone terminals.

(3) Tolerances.

When any of the measured sound levels deviate from the levels in Table C-1 or Table C-2 by ±3 dB at any test frequency between 500 and 3000 Hz, 4 dB at 4000 Hz, or 5 dB at 6000 Hz, an exhaustive calibration is required.

Table C-1 - Reference threshold levels for telephonics - TDH-39 earphones

Frequency, Hz	Reference threshold level for TDH-39 earphones, dB	Sound level meter reading, dB
500	11.5	81.5
1000	7	77
2000	9	79
3000	10	80
4000	9.5	79.5
6000	15.5	85.5

Table C-2 - Reference threshold levels for telephonics - TDH-49 Earphones

Frequency, Hz	Reference threshold level for TDH-49 earphones, dB	Sound level meter reading, dB
500	13.5	83.5
1000	7.5	77.5
2000	11	81.0
3000	9.5	79.5
4000	10.5	80.5
6000	13.5	83.5

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09051, filed 11/30/83; 82-13-045 (Order 82-22), § 296-62-09051, filed 6/11/82; 82-03-023 (Order 82-1), § 296-62-09051, filed 1/15/82.]

WAC 296-62-09053 Appendix D—Methods for estimating the adequacy of hearing protector attenuation. (1) Hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dBA.

(2) The most convenient method to use is the noise reduction rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This appendix describes two methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given

exposure environment. Selection between the two procedures is dependent upon the employer's noise measuring instruments.

(3) When using the NRR to assess hearing protector adequacy, one of the following methods must be used:

(a) When using a dosimeter that is capable of making A-weighted measurements:

- (i) Convert the A-weighted dose to TWA.
- (ii) Subtract 7 dB from the NRR.

(iii) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(b) When using a sound level meter set to the A-weighting network:

- (i) Obtain the employee's A-weighted TWA.
- (ii) Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(4) Other methods may be utilized if they are at least as effective as the NRR if approved by the director.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-62-09053, filed 11/30/83; 82-03-023 (Order 82-1), § 296-62-09053, filed 1/15/82.]

WAC 296-62-09055 Appendix E—Noise exposure computation. (1) Computation of employee noise exposure.

(a) Noise dose is computed using Table E-1 as follows:

(i) When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by: $D=100 C/T$ where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table E-1 or by the formula shown as a footnote to that table.

(ii) When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by: $D=100(C_1/T_1+C_2/T_2+...+C_n/T_n)$, where C_n indicates the total time of exposure at a specific noise level, and T_n indicates the reference duration for that level as given by Table E-1.

(b) The 8-hour time-weighted average sound level (TWA), in decibels, may be computed from the dose, in percent, by means of the formula: $TWA= 16.61 \log_{10}(D/100)+90$. For an 8-hour workshift with the noise level constant over the entire shift, the TWA is equal to the measured sound level.

(c) A table relating dose and TWA is given in subsection (2) of this section.

TABLE E-1

A-weighted sound level, L (decibel)	Reference duration, T (hour)
88	10.6
89	9.2
90	8
91	7.0
92	6.2
93	5.3
94	4.6
95	4
96	3.5
97	3.0
98	2.6
99	2.3
100	2
101	1.7
102	1.5
103	1.4
104	1.3
105	1
106	0.87
107	0.76
108	0.66
109	0.57
110	0.5
111	0.44
112	0.38
113	0.33
114	0.29
115	0.25
116	0.22
117	0.19
118	0.16
119	0.14
120	0.125
121	0.11
122	0.095
123	0.082
124	0.072
125	0.063
126	0.054
127	0.047
128	0.041
129	0.036
130	0.031

In the above table the reference duration T, is computed by

$$T= \frac{8}{2(L-90)/5}$$

where L is the measured A-weighted sound level.

(2) Conversion between "dose" and "8-hour time-weighted average" sound level.

(a) Compliance with WAC 296-62-09015 through 296-62-09055 of this regulation is determined by the amount of exposure to noise in the workplace. The amount of such exposure is usually measured with an audiodosimeter which

TABLE E-1

A-weighted sound level, L (decibel)	Reference duration, T (hour)
80	32
81	27.9
82	24.3
83	21.1
84	18.4
85	16
86	13.9
87	12.1

gives a readout in terms of "dose." In order to better understand the requirements of these standards, dosimeter readings can be converted to an "8-hour time-weighted average (TWA) sound level."

(b) In order to convert the reading of a dosimeter into TWA, see Table E-2. This table applies to dosimeters that are set by the manufacturer to calculate dose or percent exposure according to the relationships in Table E-1. So, for example, a dose of 91 percent over an eight-hour day results in a TWA of 89.3 dB, and a dose of 50 percent corresponds to a TWA of 85 dB.

(c) If the dose as read on the dosimeter is less than or greater than the values found in Table E-2, the TWA may be calculated by using the formula: $TWA = 16.61 \log_{10}(D/100) + 90$ where TWA= 8-hour time-weighted average sound level and D= accumulated dose in percent exposure.

Table E-2 - Conversion from "percent noise exposure" or "dose" to "8-hour time-weighted average sound level"

(TWA)	
Dose or percent noise exposure	TWA (dBA)
10	73.4
15	76.3
20	78.4
25	80.0
30	81.3
35	82.4
40	83.2
45	84.2
50	85.0
55	85.7
60	86.3
65	86.9
70	87.4
75	87.9
80	88.4
81	88.5
82	88.6
83	88.7
84	88.7
85	88.8
86	88.9
87	89.0
88	89.1
89	89.2
90	89.2
91	89.3
92	89.4
93	89.5
94	89.6
95	89.6
96	89.7
97	89.8
98	89.9
99	89.9
100	90.0
101	90.1
102	90.1
103	90.2

(TWA)	
Dose or percent noise exposure	TWA (dBA)
104	90.3
105	90.4
106	90.4
107	90.5
108	90.6
109	90.6
110	90.7
111	90.8
112	90.8
113	90.9
114	90.9
115	91.1
116	91.1
117	91.1
118	91.2
119	91.3
120	91.3
125	91.6
130	91.9
135	92.2
140	92.4
145	92.7
150	92.9
155	93.2
160	93.4
165	93.6
170	93.8
175	94.0
180	94.2
185	94.4
190	94.6
195	94.8
200	95.0
210	95.4
220	95.7
230	96.0
240	96.3
250	96.6
260	96.9
270	97.2
280	97.4
290	97.7
300	97.9
310	98.2
320	98.4
330	98.6
340	98.8
350	99.0
360	99.2
370	99.4
380	99.6
390	99.8
400	100.0
410	100.2
420	100.4
430	100.5
440	100.7

(TWA)	
Dose or percent noise exposure	TWA (dBA)
450	100.8
460	101.0
470	101.2
480	101.3
490	101.5
500	101.6
510	101.8
520	101.9
530	102.0
540	102.2
550	102.3
560	102.4
570	102.6
580	102.7
590	102.8
600	102.9
610	103.0
620	103.2
630	103.3
640	103.4
650	103.5
660	103.6
670	103.7
680	103.8
690	103.9
700	104.0
710	104.1
720	104.2
730	104.3
740	104.4
750	104.5
760	104.6
770	104.7
780	104.8
790	104.9
800	105.0
810	105.1
820	105.2
830	105.3
840	105.4
850	105.4
860	105.5
870	105.6
880	105.7
890	105.8
900	105.8
910	105.9
920	106.0
930	106.1
940	106.2
950	106.2
960	106.3
970	106.4
980	106.5
990	106.5
999	106.6

[Statutory Authority: RCW 49.17.040 and 49.17.050, 83-24-013 (Order 83-34), § 296-62-09055, filed 11/30/83.]

PART L—ATMOSPHERES, VENTILATION, EMERGENCY WASHING

WAC 296-62-100 Oxygen deficient atmospheres. (1)

Definition. A lack of sufficient oxygen is deemed to exist if the atmosphere at sea level has less than 19.5% oxygen by volume or has a partial pressure of oxygen of 148 millimeters of mercury (mm. Hg) or less. This may deviate when working at higher elevations and should be determined for an individual location. Factors such as acclimatization, physical conditions of the persons involved, etc., must be considered for such circumstances and conditions.

(2) Entering areas with possible oxygen deficient atmospheres. Workers entering any area where a lack of sufficient oxygen is probable shall be supplied with and shall use approved equipment (for specific requirements see applicable provisions of chapter 296-62 WAC) capable of providing safe respirable air, or prior to entry and at all times when workers are in such areas a sufficient supply of safe, respirable air shall be provided. All workers so exposed shall be under constant observation. If the oxygen content is unknown or may change during occupation, tests shall be required prior to and during occupation of questionable areas.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-62-100, filed 11/22/91, effective 12/24/91. RCW 49.17.040, 49.17.050, and 49.17.240, 81-16-015 (Order 81-20), § 296-62-100, filed 7/27/81; Order 73-3, § 296-62-100, filed 5/7/73; Order 70-8, § 296-62-100, filed 7/31/70, effective 9/1/70; Rule 10.010, effective 8/1/63.]

WAC 296-62-110 Ventilation.

[Order 73-3, § 296-62-110, filed 5/7/73; Order 70-8, § 296-62-110, filed 7/31/70, effective 9/1/70; Rules 11.010-11.030, effective 8/1/63.]

WAC 296-62-11001 Definition. Ventilation shall mean the provision, circulation or exhausting of air into or from an area or space.

(1) "Local exhaust ventilation" shall mean the mechanical removal of contaminated air from the point where the contaminant is being generated or liberated.

(2) "Dilution ventilation" means inducing and mixing uncontaminated air with contaminated air in such quantities that the resultant mixture in the breathing zone will not exceed the permissible exposure limit (PEL) specified for any contaminant.

(3) "Exhaust ventilation" means the general movement of air out of the area or permit-required confined space by mechanical or natural means.

(4) "Tempered makeup air" means air which has been conditioned by changing its heat content to obtain a specific desired temperature.

[Statutory Authority: Chapter 49.17 RCW. 95-04-007, § 296-62-11001, filed 1/18/95, effective 3/1/95. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-11001, filed 11/13/80; Order 73-3, § 296-62-11001, filed 5/7/73.]

WAC 296-62-11003 Ventilation guide. In addition to those mandatory controls as set forth in WAC 296-62-11015

through 296-62-11021, the Industrial Ventilation Manual of Recommended Practices as compiled and approved by the American Conference of Governmental Industrial Hygienists, applicable ANSI Standard or other National Consensus Standards recommended by the federal government, should be used as a guide for ventilation requirements.

[Order 73-3, § 296-62-11003, filed 5/7/73.]

WAC 296-62-11005 Adequate system. Adequate ventilation systems shall be installed as needed to control concentrations of airborne contaminants below applicable threshold limit values.

[Order 73-3, § 296-62-11005, filed 5/7/73.]

WAC 296-62-11007 Exhaust. Exhaust from ventilation systems shall discharge in such a manner that the contaminated air being exhausted will not present a health hazard to any workman or reenter buildings in harmful amounts.

[Order 73-3, § 296-62-11007, filed 5/7/73.]

WAC 296-62-11009 Make-up air quantity. Make-up air shall be of ample quantity to replace the exhausted air and shall be tempered when necessary.

[Order 73-3, § 296-62-11009, filed 5/7/73.]

WAC 296-62-11011 Design and operation. Ventilation systems shall be designed and operated in such a manner that employees will not be subjected to excessive air velocities.

[Statutory Authority: Chapter 49.17 RCW. 91-11-070 (Order 91-01), § 296-62-11011, filed 5/20/91, effective 6/20/91; Order 73-3, § 296-62-11011, filed 5/7/73.]

WAC 296-62-11013 Compatibility of systems. Make-up air systems shall be designed and operated in such a manner that they will not interfere with the effectiveness of the exhaust air system.

[Order 73-3, § 296-62-11013, filed 5/7/73.]

WAC 296-62-11015 Abrasive blasting. Abrasive blasting is covered in the General safety and health standards WAC 296-24-675, Safe practices of abrasive blasting operations (Part H-2).

[Statutory Authority: RCW 49.17.040, [49.17].050 and [49.17].060. 98-02-006, § 296-62-11015, filed 12/26/97, effective 3/1/98. Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-62-11015, filed 11/22/91, effective 12/24/91. RCW 49.17.040, 49.17.050, and 49.17.240. 81-16-015 (Order 81-20), § 296-62-11015, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-11015, filed 8/8/80; Order 73-3, § 296-62-11015, filed 5/7/73.]

WAC 296-62-11017 Grinding, polishing, and buffing operations. (1) Definitions.

(a) "Abrasive cutting-off wheels" means organic-bonded wheels, the thickness of which is not more than one forty-eighth of their diameter for those up to, and including, 20 inches in diameter, and not more than one-sixteenth of their diameter for those larger than 20 inches in diameter, used for a multitude of operations variously known as cutting, cutting

off, grooving, slotting, coping, jointing, and the like. The wheels may be "solid" consisting of organic-bonded abrasive material throughout, "steel centered" consisting of a steel disc with a rim of organic-bonded material moulded around the periphery or of the "inserted tooth" type consisting of a steel disc with organic-bonded abrasive teeth or inserts mechanically secured around the periphery.

(b) "Belts" means all power-driven, flexible, coated bands used for grinding, polishing, or buffing purposes.

(c) "Branch pipe" means the part of an exhaust system piping that is connected directly to the hood or enclosure.

(d) "Cradle" means a movable fixture, upon which the part to be ground or polished is placed.

(e) "Disc wheels" means all power-driven rotatable discs faces with abrasive materials, artificial or natural, and used for grinding or polishing on the side of the assembled disc.

(f) "Entry loss" means the loss in static pressure caused by air flowing into a duct or hood. It is usually expressed in inches of water gauge.

(g) "Exhaust system" means a system consisting of branch pipes connected to hoods of enclosures, one or more header pipes, an exhaust fan, means for separating solid contaminants from the air flowing in the system, and a discharge stack to outside.

(h) "Grinding wheels" means all power-driven rotatable grinding or abrasive wheels, except disc wheels as defined in this standard, consisting of abrasive particles held together by artificial or natural bonds and used for peripheral grinding.

(i) "Header pipe (main pipe)" means a pipe into which one or more branch pipes enter and which connects such branch pipes to the remainder of the exhaust system.

(j) "Hoods and enclosures" means the partial or complete enclosure around the wheel or disc through which air enters an exhaust system during operation.

(k) "Horizontal double-spindle disc grinder" means a grinding machine carrying two power-driven, rotatable, coaxial, horizontal spindles upon the inside ends of which are mounted abrasive disc wheels for grinding two surfaces simultaneously.

(l) "Horizontal single-spindle disc grinder" means a grinding machine carrying an abrasive disc wheel upon one or both ends of a power-driven, rotatable single horizontal spindle.

(m) "Polishing and buffing wheels" means all power-driven rotatable wheels composed all or in part of textile fabrics, wood, felt, leather, paper, and may be coated with abrasives on the periphery of the wheel for purposes of polishing, buffing, and light grinding.

(n) "Portable grinder" means any power-driven rotatable grinding, polishing, or buffing wheel mounted in such manner that it may be manually manipulated.

(o) "Scratch brush wheels" means all power-driven rotatable wheels made from wire or bristles, and used for scratch cleaning and brushing purposes.

(p) "Swing-frame grinder" means any power-driven rotatable grinding, polishing, or buffing wheel mounted in such a manner that the wheel with its supporting framework can be manipulated over stationary objects.

(q) "Velocity pressure (vp)" means the kinetic pressure in the direction of flow necessary to cause a fluid at rest to

flow at a given velocity. It is usually expressed in inches of water gauge.

(r) "Vertical spindle disc grinder" means a grinding machine having a vertical, rotatable power-driven spindle carrying a horizontal abrasive disc wheel.

(2) Application.

(a) Every establishment performing dry grinding, dry polishing, or buffing shall provide suitable hood or enclosures that are connected to exhaust systems.

(b) Such exhaust systems shall be operated continuously whenever such operations are carried on, and be capable of preventing contaminants from entering the breathing zone.

(3) Hood and branch pipe requirements.

(a) Hoods connected to exhaust systems shall be used, and such hoods shall be designed, located, and placed so that the dust or dirt particles shall fall or be projected into the hoods in the direction of the air flow. No wheels, discs, straps, or belts shall be operated in such manner and in such direction as to cause the dust and dirt particles to be thrown into the operator's breathing zone.

(b) Grinding wheels on floor stands, pedestals, benches, and special-purpose grinding machines and abrasive cutting-off wheels shall have not less than the minimum exhaust volumes shown in Table 8 with a recommended minimum duct velocity of 4,500 feet per minute in the branch and 3,500 feet per minute in the main. The entry losses from all hoods except the vertical-spindle disc grinder hood, shall equal 0.65 velocity pressure for a straight takeoff and 0.45 velocity pressure for a tapered takeoff. The entry loss for the vertical-spindle disc grinder hood is shown in Figure 3. (See Fig. 3 following this section.)

TABLE 8
GRINDING AND ABRASIVE CUTTING-OFF WHEELS

Wheel diameter (inches)	Wheel width (inches)	Minimum exhaust volume (feet ³ /min.)
To 9	1 1/2	220
Over 9 to 16	2	390
Over 16 to 19	3	500
Over 19 to 24	4	610
Over 24 to 30	5	880
Over 30 to 36	6	1,200

For any wheel wider than wheel diameter shown in Table 8, increase the exhaust volume by the ratio of the new width to the width shown.

Example:

If wheel width= 4 1/2 inches, then
 $\frac{4.5}{4} \times 610 = 686$ (rounded to 690).

(c) Scratch-brush wheels and all buffing and polishing wheels mounted on floor stands, pedestals, benches, or special-purpose machines shall have not less than the minimum exhaust volume shown in Table 9.

TABLE 9
BUFFING AND POLISHING WHEELS

Wheel diameter (inches)	Wheel width (inches)	Minimum exhaust volume (feet ³ /min.)
To 9	2	300
Over 9 to 16	3	500
Over 16 to 19	4	610
Over 19 to 24	5	740
Over 24 to 30	6	1,040
Over 30 to 36	6	1,200

(d) Grinding wheels or discs for horizontal single-spindle disc grinders shall be hooded to collect the dust or dirt generated by the grinding operation and the hoods shall be connected to branch pipes having exhaust volumes as shown in Table 10.

TABLE 10
HORIZONTAL SINGLE-SPINDLE DISC GRINDER

Disc diameter (inches)	Exhaust volume (feet ³ /min.)
Up to 12	220
Over 12 to 19	390
Over 19 to 30	610
Over 30 to 36	880

(e) Grinding wheels or discs for horizontal double-spindle disc grinders shall have a hood enclosing the grinding chamber and the hood shall be connected to one or more branch pipes having exhaust volumes as shown in Table 11.

TABLE 11
HORIZONTAL DOUBLE-SPINDLE DISC GRINDER

Disc diameter (inches)	Exhaust volume (feet ³ /min.)
Up to 19	610
Over 19 to 25	880
Over 25 to 30	1,200
Over 30 to 53	1,770
Over 53 to 72	6,280

(f) Grinding wheels or discs for vertical single-spindle disc grinders shall be encircled with hoods to remove the dust generated in the operation. The hoods shall be connected to one or more branch pipes having exhaust volumes as shown in Table 12.

TABLE 12
VERTICAL SPINDLE DISC GRINDER

Disc diameter (inches)	One-half or more of disc covered		Disc not covered	
	Number ¹	Exhaust feet ³ /min.	Number ¹	Exhaust feet ³ /min.
Up to 20	1	500	2	780
Over 20 to 30	2	780	2	1,480
Over 30 to 53	2	1,770	4	3,530
Over 53 to 72	2	3,140	5	6,010

¹Number of exhaust outlets around periphery of hood, or equal distribution provided by other means.

(g) Grinding and polishing belts shall be provided with hoods to remove dust and dirt generated in the operations and the hoods shall be connected to branch pipes having exhaust volumes as shown in Table 13.

TABLE 13
GRINDING AND POLISHING BELTS

Belts width (inches)	Exhaust volume (feet ³ /min.)
Up to 3	220
Over 3 to 5	300
Over 5 to 7	390
Over 7 to 9	500
Over 9 to 11	610
Over 11 to 13	740

(h) Cradles and swing-frame grinders. Where cradles are used for handling the parts to be ground, polished, or buffed, requiring large partial enclosures to house the complete operation, a minimum average air velocity of 150 feet per minute shall be maintained over the entire opening of the enclosure. Swing-frame grinders shall also be exhausted in the same manner as provided for cradles. (See Fig. 5 following this section.)

(i) Where the work is outside the hood, air volumes must be increased as shown in American Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960 (Section 4, Exhaust Hoods).

(4) Exhaust systems.

(a) Exhaust systems for grinding, polishing, and buffing operations should be designed in accordance with American Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960.

(b) Exhaust systems for grinding, polishing, and buffing operations shall be tested in the manner described in American Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960.

(c) All exhaust systems shall be provided with suitable dust collectors.

(5) Hood and enclosure design.

(a)(i) It is the dual function of grinding and abrasive cutting-off wheel hoods to protect the operator from the hazards of bursting wheels as well as to provide a means for the removal of dust and dirt generated. All hoods shall be not less in structural strength than specified in the American National Standard Code for the Use, Care, and Protection of Abrasive Wheels, B7.1-1970.

(ii) For grinding machines for which no standard hoods are available, hoods meeting the requirements of (5)(a)(i) above shall be developed and so located so as to comply with the requirements of this section.

(b) Exhaust hoods for floor stands, pedestals, and bench grinders shall be designed in accordance with Figure 4. (See Fig. 4 following this section.) The adjustable tongue shown in the figure shall be kept in working order and shall be adjusted within one-fourth inch of the wheel periphery at all times.

(c) Swing-frame grinders shall be provided with exhaust booths as indicated in Figure 5. (See Fig. 5 following this section.)

(d) Portable grinding operations, whenever the nature of the work permits, shall be conducted within a partial enclosure. The opening in the enclosure shall be no larger than is actually required in the operation and an average face air velocity of not less than 200 feet per minute shall be maintained.

(e) Hoods for polishing and buffing and scratch-brush wheels shall be constructed to conform as closely to Figure 6 as the nature of the work will permit. (See Fig. 6 following this section.)

(f) Cradle grinding and polishing operations shall be performed within a partial enclosure similar to Figure 7. (See Fig. 7 following this section.) The operator shall be positioned outside the working face of the opening of the enclosure. The face opening of the enclosure should not be any greater in area than that actually required for the performance of the operation and the average air velocity into the working face of the enclosure shall not be less than 150 feet per minute.

(g) Hoods for horizontal single-spindle disc grinders shall be constructed to conform as closely as possible to the hood shown in Figure 8. (See Fig. 8 following this section.) It is essential that there be a space between the back of the wheel and the hood, and a space around the periphery of the wheel of at least 1 inch in order to permit the suction to act around the wheel periphery. The opening on the side of the disc shall be no larger than is required for the grinding operation, but must never be less than twice the area of the branch outlet.

(h) Horizontal double-spindle disc grinders shall have a hood encircling the wheels and grinding chamber similar to that illustrated in Figure 9. (See Fig. 9 following this section.) The openings for passing the work into the grinding chamber should be kept as small as possible, but must never be less than twice the area of the branch outlets.

(i) Vertical-spindle disc grinders shall be encircled with a hood so constructed that the heavy dust is drawn off a surface of the disc and the lighter dust exhausted through a continuous slot at the top of the hood as shown in Figure 3. (See Fig. 3 following this section.)

(j) Grinding and polishing belt hoods shall be constructed as close to the operation as possible. The hood should extend almost to the belts, and 1-inch wide openings should be provided on either side. Figure 10 shows a typical hood for a belt operation. (See Fig. 10 following this section.)

(6) Scope. This paragraph, prescribes the use of exhaust hood enclosures and systems in removing dust, dirt, fumes, and gases generated through the grinding, polishing, or buffing of ferrous and nonferrous metals.

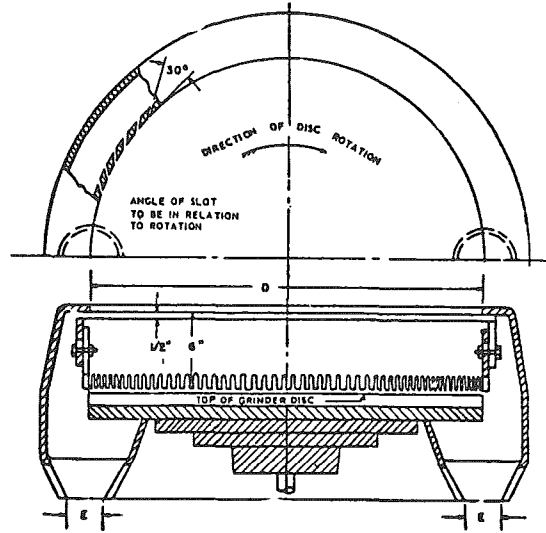


Fig. 3
Vertical Spindle Disc Grinder Exhaust Hood and Branch Pipe Connections

Dia D, Inches		Exhaust E		Volume Exhausted at 4,500 ft/min	Note
Min.	Max	No. Pipes	Dia	ft ³ /min	
Over 20	20	1	4 1/2	500	When one-half or more of the disc can be hooded, use exhaust ducts as shown at the left.
Over 30	30	2	4	780	
Over 30	72	2	6	1,770	
Over 53	72	2	8	3,140	
Over 20	20	2	4	780	When no hood can be used over disc, use exhaust ducts as shown at left.
Over 20	30	2	5 1/2	1,480	
Over 30	53	4	6	3,530	
Over 53	72	5	7	6,010	

Entry loss= 1.0 slot velocity pressure+ 0.5 branch velocity pressure
Minimum slot velocity= 2,000 ft/min - 1/2-inch slot width

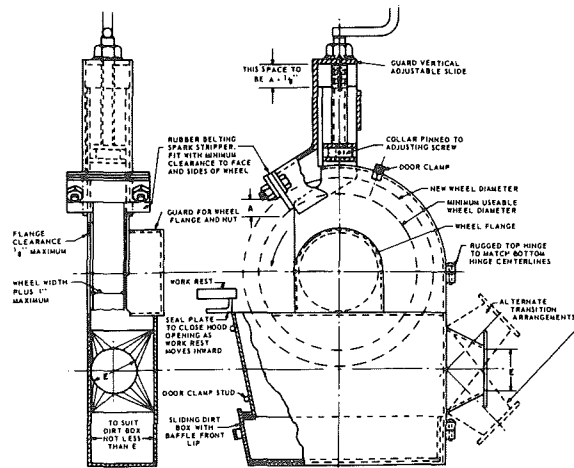


Fig. 4
Standard Grinder Hood

Wheel Dimension		Exhaust Outlet Inches	Volume of Air at 4,500 ft/min	
Diameter, Inches	Width, Inches			
Min= d	Max= D	Max	E	
	9	1 1/2	3	220
Over 9	16	2	4	390
Over 16	19	3	4 1/2	500
Over 19	24	4	5	610
Over 24	30	5	6	880
Over 30	36	6	7	1,200

Entry loss = 0.45 velocity pressure for tapered takeoff
 0.65 velocity pressure for straight takeoff

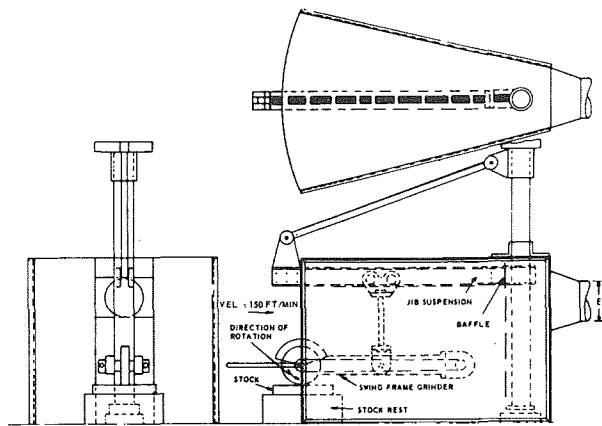


Fig. 5

A method of Applying an Exhaust Enclosure to Swing-Frame Grinders

Note: Baffle to reduce front opening as much as possible

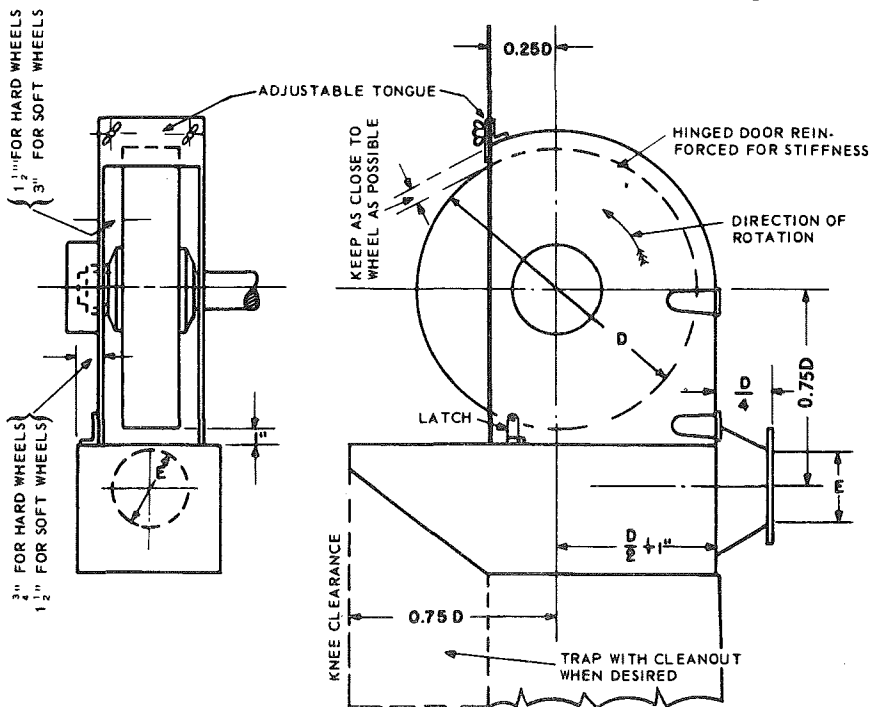


Fig. 6
Standard Buffing and Polishing Hood

Wheel Dimension, Inches		Width	Exhaust Outlet Inches	Volume of Air at 4,500 ft/min
Diameter				
Min= d	Max= D	Max	E	
	9	2	3 1/2	300
Over 9	16	3	4	500
Over 16	19	4	5	610
Over 19	24	5	5 1/2	740
Over 24	30	6	6 1/2	1,040
Over 30	36	6	7	1,200

Entry loss = 0.45 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff

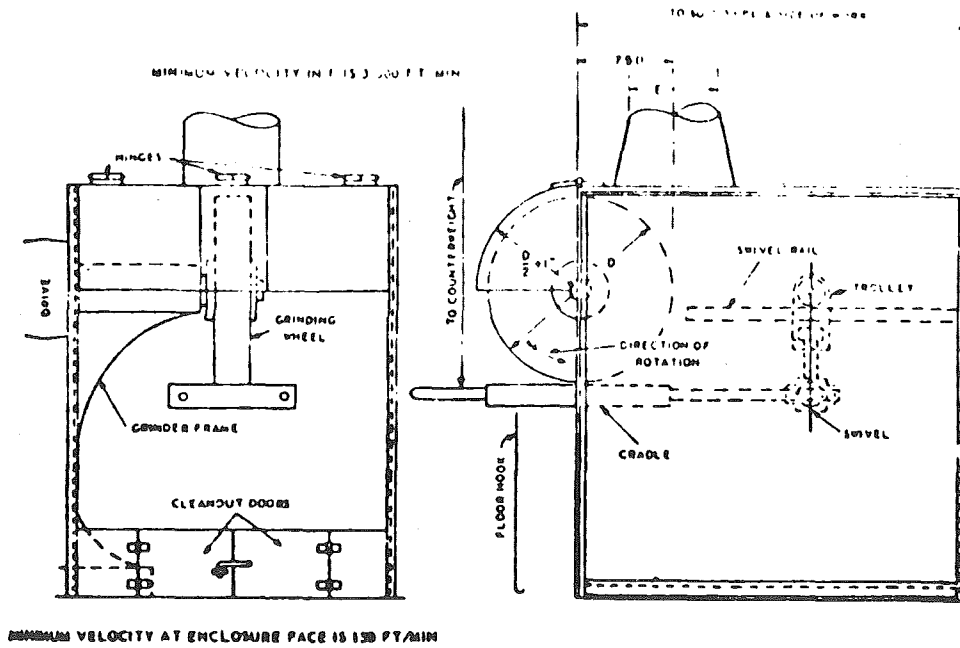


Fig. 7
Cradle Polishing or Grinding Enclosure
Entry loss= 0.45 velocity pressure for tapered takeoff

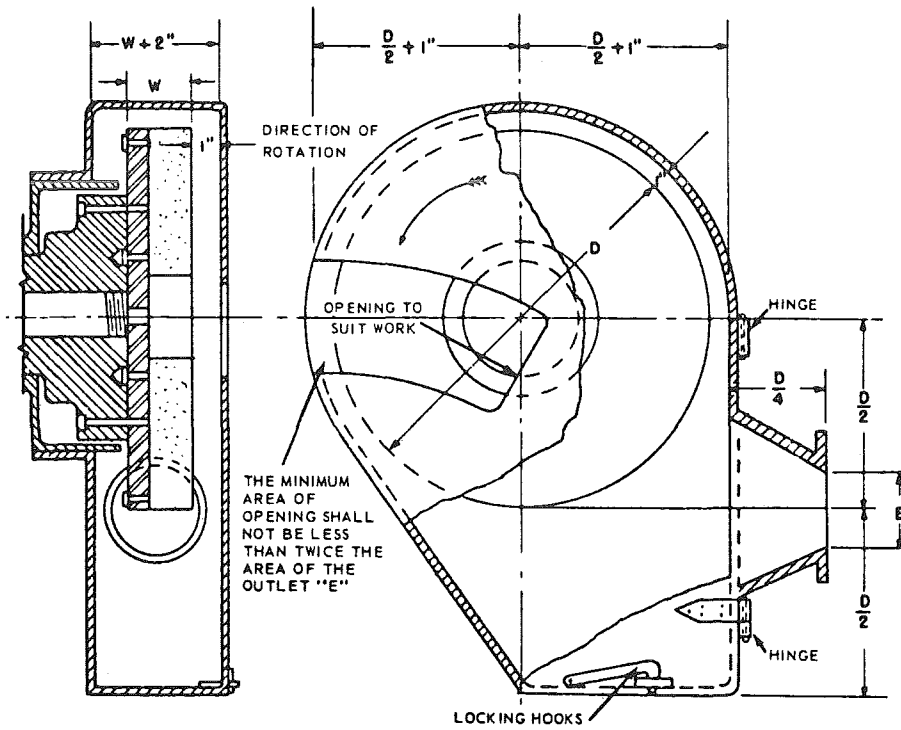


Fig. 8
Horizontal Single-Spindle Disc Grinder
Exhaust Hood and Branch Pipe Connection

Dia. D. Inches		Exhaust E	Volume Exhausted at 4,500 ft/min ft ³ /min
Min	Max	Dia. Inches	
	12	3	220
Over 12	19	4	390
Over 19	30	5	610
Over 30	36	6	880

Note: If grinding wheels are used for disc grinding purposes, hoods must conform to structural strength and materials as described in 9.1.

Entry loss= 0.45 velocity pressure for tapered takeoff

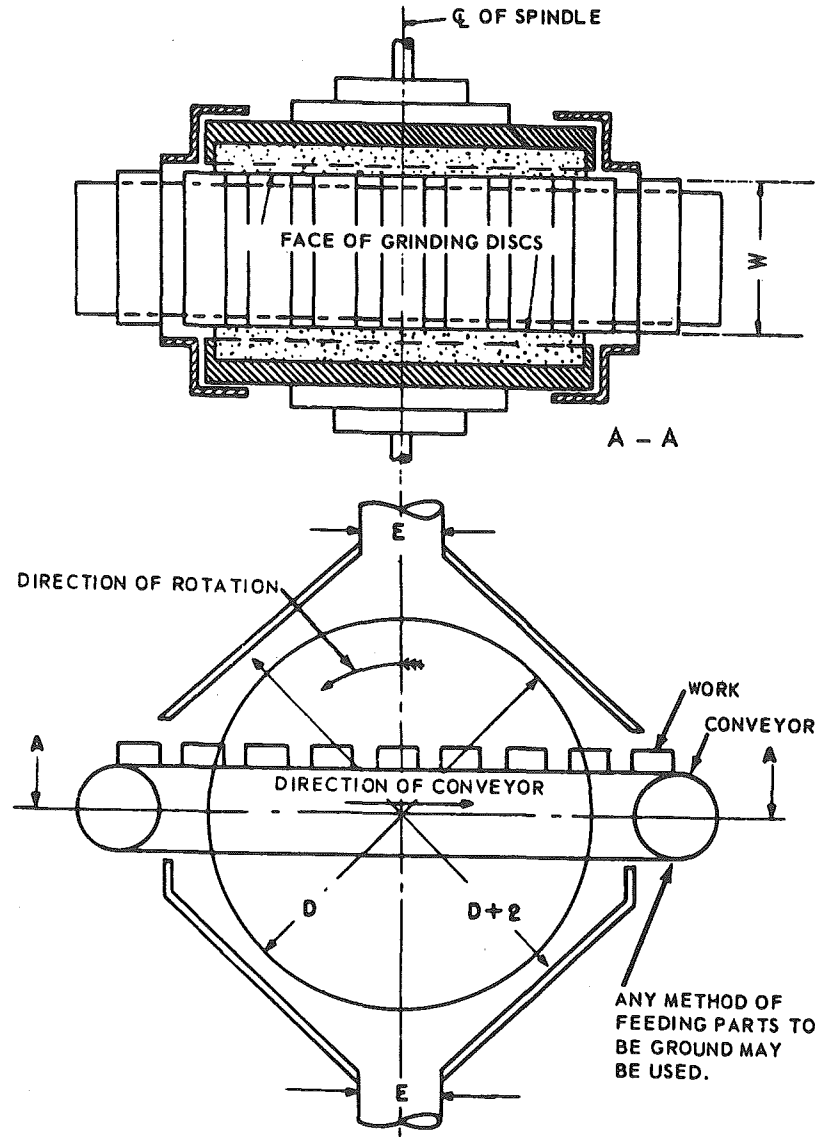


Fig. 9
Horizontal Double-Spindle Disc Grinder
Exhaust Hood and Branch Pipe Connection

Disc Dia. Inches		Exhaust E		Volume Exhausted at 4,500 ft/min ft ³ /min	Note
Min.	Max	No. Pipes	Dia		
	19	1	5	610	When width "W" permits, exhaust ducts should be as near heaviest grinding as possible.
Over 19	25	1	6	880	
Over 25	30	1	7	1,200	
Over 30	53	2	6	1,770	
Over 53	72	4	8	6,280	

Entry loss= 0.45 velocity pressure for tapered takeoff

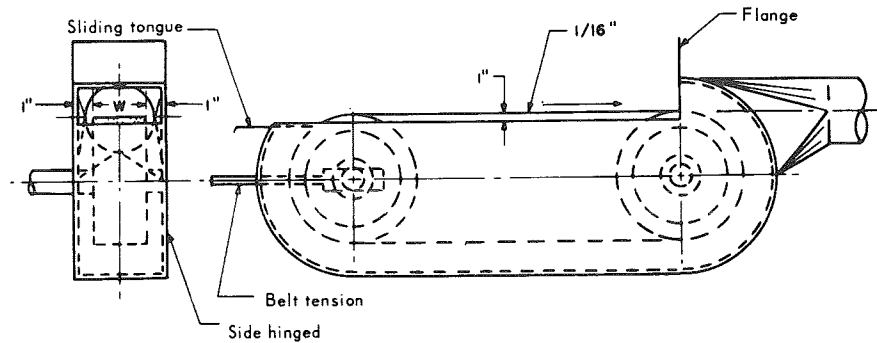


Fig. 10
A Typical Hood for a Belt Operation

Belt Width w. Inches	Exhaust Volume. ft ³ /min
up to 3	220
3 to 5	300
5 to 7	390
7 to 9	500
9 to 11	610
11 to 13	740

Minimum duct velocity = 4.500 ft./min. branch.
3.500 ft./min. main.

Entry loss = 0.45 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff

[Order 73-3, § 296-62-11017 and diagrams, filed 5/7/73.]

WAC 296-62-11019 Spray-finishing operations. (1)

Definitions.

(a) "Spray-finishing operations" means employment of methods wherein organic or inorganic materials are utilized in dispersed form from deposit on surfaces to be coated, treated or cleaned. Such methods of deposit may involve either automatic, manual, or electrostatic deposition but do not include metal spraying or metallizing, dipping, flow coating, roller coating, tumbling, centrifuging, or spray washing and degreasing as conducted in self-contained washing and degreasing machines or systems.

(b) "Spray booth" spray booths are defined and described in WAC 296-24-370 through 296-24-37007. (See sections 103, 104, and 105 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969.)

(c) "Spray room" means a room in which spray-finishing operations not conducted in a spray booth are performed separately from other areas.

(d) "Minimum maintained velocity" means the velocity of air movement which must be maintained in order to meet minimum specified requirements for health and safety.

(2) Location and application. Spray booths or spray rooms are to be used to enclose or confine all operations. Spray-finishing operations shall be located as provided in sections 201 through 206 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969.

(3) Design and construction of spray booths.

(a) Spray booths shall be designed and constructed in accordance with WAC 296-24-370 through 296-24-37007 (see sections 301-304 and 306-310 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969), for general construction specifications.

Note: For a more detailed discussion of fundamentals relating to this subject, see ANSI Z9.2-1960.

(i) Lights, motors, electrical equipment and other sources of ignition shall conform to the requirements of WAC 296-24-370. (See section 310 and chapter 4 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969.)

(ii) In no case shall combustible material be used in the construction of a spray booth and supply or exhaust duct connected to it.

(b) Unobstructed walkways shall not be less than 6 1/2 feet high and shall be maintained clear of obstruction from any work location in the booth to a booth exit or open booth front. In booths where the open front is the only exit, such exits shall be not less than 3 feet wide. In booths having multiple exits, such exits shall not be less than 2 feet wide, provided that the maximum distance from the work location to the exit is 25 feet or less. Where booth exits are provided with doors, such doors shall open outward from the booth.

(c) Baffles, distribution plates, and dry-type overspray collectors shall conform to the requirements of WAC 296-24-370. (See sections 304 and 305 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969.)

(i) Overspray filters shall be installed and maintained in accordance with the requirements of WAC 296-24-370, (See section 305 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969), and shall only be in a location easily accessible for inspection, cleaning, or replacement.

(ii) Where effective means, independent of the overspray filters are installed which will result in design air distribution across the booth cross section, it is permissible to operate the booth without the filters in place.

(d)(i) For wet or water-wash spray booths, the water-chamber enclosure, within which intimate contact of contaminated air and cleaning water or other cleaning medium is

maintained, if made of steel, shall be 18 gauge or heavier and adequately protected against corrosion.

(ii) Chambers may include scrubber spray nozzles, headers, troughs, or other devices. Chambers shall be provided with adequate means for creating and maintaining scrubbing action for removal of particulate matter from the exhaust air stream.

(e) Collecting tanks shall be of welded steel construction or other suitable noncombustible material. If pits are used as collecting tanks, they shall be concrete, masonry, or other material having similar properties.

(i) Tanks shall be provided with weirs, skimmer plates, or screens to prevent sludge and floating paint from entering the pump suction box. Means for automatically maintaining the proper water level shall also be provided. Fresh water inlets shall not be submerged. They shall terminate at least one pipe diameter above the safety overflow level of the tank.

(ii) Tanks shall be so constructed as to discourage accumulation of hazardous deposits.

(f) Pump manifolds, risers, and headers shall be adequately sized to insure sufficient water flow to provide efficient operation of the water chamber.

(4) Design and construction of spray rooms.

(a) Spray rooms, including floors, shall be constructed of masonry, concrete, or other noncombustible material.

(b) Spray rooms shall have noncombustible fire doors and shutters.

(c) Spray rooms shall be adequately ventilated so that the atmosphere in the breathing zone of the operator shall be maintained in accordance with the requirements of (6)(b) of this section.

(d) Spray rooms used for production spray-finishing operations shall conform to the requirements of spray booths.

(5) Ventilation.

(a) Ventilation shall be provided in accordance with provisions of WAC 296-24-370, (See chapter 5 of the Standard for Spray Finishing Using Flammable or Combustible Materials, NFPA No. 33-1969), and in accordance with the following:

(i) Where a fan plenum is used to equalize or control the distribution of exhaust air movement through the booth, it shall be of sufficient strength or rigidity to withstand the differential air pressure or other superficially imposed loads for which the equipment is designed and also to facilitate cleaning. Construction specifications shall be at least equivalent to those of (5)(c) of this section.

(ii) All fan ratings shall be in accordance with Air Moving and Conditioning Association Standard Test Code for Testing Air Moving Devices, Bulletin 210, April 1962.

(b) Inlet or supply ductwork used to transport makeup air to spray booths or surrounding areas shall be constructed of noncombustible materials.

(i) If negative pressure exists within inlet ductwork, all seams and joints shall be sealed if there is a possibility of infiltration of harmful quantities of noxious gases, fumes, or mists from areas through which ductwork passes.

(ii) Inlet ductwork shall be sized in accordance with volume flow requirements and provide design air requirements at the spray booth.

(iii) Inlet ductwork shall be so supported throughout its length to sustain at least its own weight plus any negative pressure which is exerted upon it under normal operating conditions.

(c) Ducts shall be so constructed as to provide structural strength and stability at least equivalent to sheet steel of not less than the following thickness:

DIAMETER OR GREATER DIMENSION

	(U.S. gauge)
Up to 8 inches inclusive	No. 24
Over 8 inches to 18 inches inclusive	No. 22
Over 18 inches to 30 inches inclusive	No. 20
Over 30 inches	No. 18

(i) Exhaust ductwork shall be adequately supported throughout its length to sustain its weight plus any normal accumulation in interior during normal operating conditions and any negative pressure exerted upon it.

(ii) Exhaust ductwork shall be sized in accordance with good design practice which shall include consideration of fan capacity, length of duct, number of turns and elbows, variation in size, volume, and character of materials being exhausted. See American National Standard Z9.2-1960 for further details and explanation concerning elements of design.

(iii) Longitudinal joints in sheet steel ductwork shall be either lock-seamed, riveted, or welded. For other than steel construction, equivalent securing of joints shall be provided.

(iv) Circumferential joints in ductwork shall be substantially fastened together and lapped in the direction of airflow. At least every fourth joint shall be provided with connecting flanges, bolted together or of equivalent fastening security.

(v) Inspection or clean-out doors shall be provided for every 9 to 12 feet of running length for ducts up to 12 inches in diameter, but the distance between clean-out doors may be greater for larger pipes. (See 8.3.21 of American National Standard Z9.1-1960.) A clean-out door or doors shall be provided for servicing the fan, and where necessary, a drain shall be provided.

(vi) Where ductwork passes through a combustible roof or wall, the roof or wall shall be protected at the point of penetration by open space or fire-resistive material between the duct and the roof or wall. When ducts pass through fire-walls, they shall be provided with automatic fire dampers on both sides of the wall, except that three-eighth-inch steel plates may be used in lieu of automatic fire dampers for ducts not exceeding 18 inches in diameter.

(vii) Ductwork used for ventilating any process covered in this standard shall not be connected to ducts ventilating any other process or any chimney or flue used for conveying any products of combustion.

(6) Velocity and air flow requirements.

(a) Except where a spray booth has an adequate air replacement system, the velocity of air into all openings of a spray booth shall be not less than that specified in Table 14 for the operating conditions specified. An adequate air replacement system is one which introduces replacement air upstream or above the object being sprayed and is so designed that the velocity of air in the booth cross section is

not less than that specified in Table 14 when measured upstream or above the object being sprayed.

TABLE 14
MINIMUM MAINTAINED VELOCITIES
INTO SPRAY BOOTHS

Operating Airflow conditions for object completely inside booth	Crossdraft f.p.m.	Velocities, f.p.m.	
		Design	Range
Electrostatic and automatic airless operation contained in booth without operator.	Negligible	50 large booth	50-75
		100 small booth	75-125
		150 small booth	125-175
Air-operated guns, manual or automatic	Up to 50	100 large booth	75-125
		150 small booth	125-175
Air-operated guns, manual or automatic	Up to 100	150 large booth	125-175
		200 small booth	150-250

- Notes: (1) Attention is invited to the fact that the effectiveness of the spray booth is dependent upon the relationship of the depth of the booth to its height and width.
- (2) Crossdrafts can be eliminated through proper design and such design should be sought. Crossdrafts in excess of 100 fpm (feet per minute) should not be permitted.
- (3) Excessive air pressures result in loss of both efficiency and material waste in addition to creating a backlash that may carry overspray and fumes into adjacent work areas.
- (4) Booths should be designed with velocity shown in the column headed "Design." However, booths operating with velocities shown in the column headed "Range" are in compliance with this standard.

(b) In addition to the requirements in (6)(a) of this section the total air volume exhausted through a spray booth shall be such as to dilute solvent vapor to at least 25 percent of the lower explosive limit of the solvent being sprayed. An example of the method of calculating this volume is given below.

Example: To determine the lower explosive limits of the most common solvents used in spray finishing, see Table 15. Column 1 gives the number of cubic feet of vapor per gallon of solvent and column 2 gives the lower explosive limit (LEL) in percentage by volume of air. Note that the quantity of solvent will be diminished by the quantity of solids and nonflammable contained in the finish.

To determine the volume of air in cubic feet necessary to dilute the vapor from 1 gallon of solvent to 25 percent of the lower explosive limit, apply the following formula:

$$\text{Dilution volume required per gallon of solvent} = \frac{4 (100 - \text{LEL}) (\text{cubic feet of vapor per gallon})}{\text{LEL}}$$

Using toluene as the solvent.

- (1) LEL of toluene from Table 15, column 2, is 1.4 percent.
- (2) Cubic feet of vapor per gallon from Table 15, column 1, is 30.4 cubic feet per gallon.
- (3) Dilution volume required = $\frac{4 (100 - 1.4) 30.4}{1.4} = 8,564$ cubic feet.

(4) To convert to cubic feet per minute of required ventilation, multiply the dilution volume required per gallon of solvent by the number of gallons of solvent evaporated per minute.

TABLE 15
LOWER EXPLOSIVE LIMIT OF SOME
COMMONLY USED SOLVENTS

Solvent	Cubic feet of vapor per gallon of liquid at 70°F.	Lower explosive limit in percent by volume of air at 70°F.
	Column 1	Column 2
Acetone	44.0	2.6
Amyl Acetate (iso)	21.6	1.0 ¹
Amyl Alcohol (n)	29.6	1.2
Amyl Alcohol (iso)	29.6	1.2
Benzene	36.8	1.4 ¹
Butyl Acetate (n)	24.8	1.7
Butyl Alcohol (n)	35.2	1.4
Butyl Cellosolve	24.8	1.1
Cellosolve	33.6	1.8
Cellosolve Acetate	23.2	1.7
Cyclohexanone	31.2	1.1 ¹
1,1 Dichloroethylene	42.4	5.6
1,2 Dichloroethylene	42.4	9.7
Ethyl Acetate	32.8	2.5
Ethyl Alcohol	55.2	4.3
Ethyl Lactate	28.0	1.5 ¹
Methyl Acetate	40.0	3.1
Methyl Alcohol	80.8	7.3
Methyl Cellosolve	40.8	2.5
Methyl Ethyl Ketone	36.0	1.8
Methyl n-Propyl Ketone	30.4	1.5
Naphtha (VM&P) (76°		
Naphtha	22.4	0.9
Naphtha (100° Flash) Safety Solvent-Stoddard Solvent	23.2	1.1
Propyl Acetate (n)	27.2	2.0
Propyl Acetate (iso)	28.0	1.8
Propyl Alcohol (n)	44.8	2.1
Propyl Alcohol (iso)	44.0	2.0
Toluene	30.4	1.4
Turpentine	20.8	0.8
Xylene (o)	26.4	1.0

¹At 212°F.

(c)(i) When an operator is in a booth downstream of the object being sprayed, an air-supplied respirator or other type of respirator certified by NIOSH under 42 CFR part 84 for the material being sprayed should be used by the operator.

(ii) Where downdraft booths are provided with doors, such doors shall be closed when spray painting.

(7) Make-up air.

(a) Clean fresh air, free of contamination from adjacent industrial exhaust systems, chimneys, stacks, or vents, shall be supplied to a spray booth or room in quantities equal to the volume of air exhausted through the spray booth.

(b) Where a spray booth or room receives make-up air through self-closing doors, dampers, or louvers, they shall be fully open at all times when the booth or room is in use for spraying. The velocity of air through such doors, dampers, or

louvers shall not exceed 200 feet per minute. If the fan characteristics are such that the required air flow through the booth will be provided, higher velocities through the doors, dampers, or louvers may be used.

(c)(i) Where the air supply to a spray booth or room is filtered, the fan static pressure shall be calculated on the assumption that the filters are dirty to the extent that they require cleaning or replacement.

(ii) The rating of filters shall be governed by test data supplied by the manufacturer of the filter. A pressure gauge shall be installed to show the pressure drop across the filters. This gauge shall be marked to show the pressure drop at which the filters require cleaning or replacement. Filters shall be replaced or cleaned whenever the pressure drop across them becomes excessive or whenever the air flow through the face of the booth falls below that specified in Table 14.

(d)(i) Means of heating make-up air to any spray booth or room, before or at the time spraying is normally performed, shall be provided in all places where the outdoor temperature may be expected to remain below 55° F. for appreciable periods of time during the operation of the booth except where adequate and safe means of radiant heating for all operating personnel affected is provided. The replacement air during the heating seasons shall be maintained at not less than 65° F. at the point of entry into the spray booth or spray room. When otherwise unheated make-up air would be at a temperature of more than 10° F. below room temperature, its temperature shall be regulated as provided in section 3.6 of ANSI Z9.2-1960.

(ii) As an alternative to an air replacement system complying with the preceding section, general heating of the building in which the spray room or booth is located may be employed provided that all occupied parts of the building are maintained at not less than 65° F. when the exhaust system is in operation or the general heating system supplemented by other sources of heat may be employed to meet this requirement.

(iii) No means of heating make-up air shall be located in a spray booth.

(iv) Where make-up air is heated by coal or oil, the products of combustion shall not be allowed to mix with the make-up air, and the products of combustion shall be conducted outside the building through a flue terminating at a point remote from all points where make-up air enters the building.

(v) Where make-up air is heated by gas, and the products of combustion are not mixed with the make-up air but are conducted through an independent flue to a point outside the building remote from all points where make-up air enters the building, it is not necessary to comply with (7)(d)(vi) of this section.

(vi) Where make-up air to any manually operated spray booth or room is heated by gas and the products of combustion are allowed to mix with the supply air, the following precautions must be taken:

(A) The gas must have a distinctive and strong enough odor to warn workmen in a spray booth or room of its presence if in an unburned state in the make-up air.

(B) The maximum rate of gas supply to the make-up air heater burners must not exceed that which would yield in

excess of 200 p.p.m. (parts per million) of carbon monoxide or 2,000 p.p.m. of total combustible gases in the mixture if the unburned gas upon the occurrence of flame failure were mixed with all of the make-up air supplied.

(C) A fan must be provided to deliver the mixture of heated air and products of combustion from the plenum chamber housing the gas burners to the spray booth or room.

(8) Scope. Spray booths or spray rooms are to be used to enclose or confine all spray finishing operations covered by this paragraph. This paragraph does not apply to the spraying of the exteriors of buildings, fixed tanks, or similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-11019, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, 49.17.050, and 49.17.240. 81-16-015 (Order 81-20), § 296-62-11019, filed 7/27/81; Order 73-3, § 296-62-11019, filed 5/7/73.]

WAC 296-62-11021 Open surface tanks. (1) General.

(a) This section applies to all operations involving the immersion of materials in liquids, or in the vapors of such liquids, for the purpose of cleaning or altering the surface or adding to or imparting a finish thereto or changing the character of the materials, and their subsequent removal from the liquid or vapor, draining, and drying. These operations include washing, electroplating, anodizing, pickling, quenching, dyeing, dipping, tanning, dressing, bleaching, degreasing, alkaline cleaning, stripping, rinsing, digesting, and other similar operations.

(b) Except where specific construction specifications are prescribed in this section, hoods, ducts, elbows, fans, blowers, and all other exhaust system parts, components, and supports thereof shall be so constructed as to meet conditions of service and to facilitate maintenance and shall conform in construction to the specifications contained in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960.

(2) Classification of open-surface tank operations.

(a) Open-surface tank operations shall be classified into 16 classes, numbered A-1 to D-4, inclusive.

(b) Determination of class. Class is determined by two factors, hazard potential designated by a letter from A to D, inclusive, and rate of gas, vapor, or mist evolution designated by a number from 1 to 4, inclusive (for example, B.3).

(c) Hazard potential is an index, on a scale of from A to D, inclusive, of the severity of the hazard associated with the substance contained in the tank because of the toxic, flammable, or explosive nature of the vapor, gas, or mist produced therefrom. The toxic hazard is determined from the concentration, measured in parts by volume of a gas or vapor, per million parts by volume of contaminated air (ppm), or in milligrams of mist per cubic meter of air (mg/m³), below which ill effects are unlikely to occur to the exposed worker. The concentrations shall be those in WAC 296-62-075 through 296-62-07515.

(d) The relative fire or explosion hazard is measured in degrees Fahrenheit in terms of the closed-cup flash point of the substance in the tank. Detailed information on the prevention of fire hazards in dip tanks may be found in Dip Tanks Containing Flammable or Combustible Liquids, NFPA No.

34-1966, National Fire Protection Association. Where the tank contains a mixture of liquids, other than organic solvents, whose effects are additive, the hygienic standard of the most toxic component (for example, the one having the lowest ppm or mg/m³) shall be used, except where such substance constitutes an insignificantly small fraction of the mixture. For mixtures of organic solvents, their combined effect, rather than that of either individually, shall determine the hazard potential. In the absence of information to the contrary, the effects shall be considered as additive. If the sum of the ratios of the airborne concentration of that contaminant exceeds unity, the toxic concentration shall be considered to have been exceeded. (See Note A of (2)(e) of this section.)

(e) Hazard potential shall be determined from Table 16, with the value indicating greater hazard being used. When the hazardous material may be either a vapor with a permissible exposure limit in ppm or a mist with a TLV in mg/m³, the TLV indicating the greater hazard shall be used (for example, A takes precedence over B or C; B over C; C over D).

Note A:

$$\frac{c_1}{PEL} + \frac{c_2}{PEL} + \frac{c_3}{PEL} + \dots + \frac{c_N}{PEL} > 1$$

where:

c = Concentration measured at the operation in ppm.

TABLE 16
DETERMINATION OF HAZARD POTENTIAL
Toxicity Group

Hazard potential	Gas or vapor (ppm)		Mist (mg/m ³)		Flash point (in degrees F.)
	0 - 10	11 - 100	0 - 0.1	0.11 - 1.0	
A	0 - 10	11 - 100	0 - 0.1	0.11 - 1.0	Under 100
B	11 - 100	101 - 500	0.11 - 1.0	1.1 - 10	100-200
C	101 - 500	Over 500	Over 10	10	Over 200
D	Over 500				

(f) Rate of gas, vapor, or mist evolution is a numerical index, on a scale of from 1 to 4, inclusive, both of the relative capacity of the tank to produce gas, vapor, or mist and of the relative energy with which it is projected or carried upwards from the tank. Rate is evaluated in terms of;

(i) The temperature of the liquid in the tank in degrees Fahrenheit;

(ii) The number of degrees Fahrenheit that this temperature is below the boiling point of the liquid in degrees Fahrenheit;

(iii) The relative evaporation of the liquid in still air at room temperature in an arbitrary scale—fast, medium, slow, or nil; and

(iv) The extent that the tank gasses or produces mist in an arbitrary scale—high, medium, low, and nil. (See Table 17, Note 2.) Gassing depends upon electrochemical or mechanical processes, the effects of which have to be individually evaluated for each installation (see Table 17, Note 3).

(g) Rate of evolution shall be determined from Table 17. When evaporation and gassing yield different rates, the lowest numerical value shall be used.

TABLE 17
DETERMINATION OF RATE OF GAS, VAPOR, OR MIST EVOLUTION¹

Rate	Liquid temperature, °F	Degrees below boiling point	Evaporation ²	Relative Gassing ³
1	Over 200	0-20	Fast	High
2	150-200	21-50	Medium	Medium
3	94-149	51-100	Slow	Low
4	Under 94	Over 100	Nil	Nil

Note 1. In certain classes of equipment, specifically vapor degreasers, an internal condenser or vapor level thermostat is used to prevent the vapor from leaving the tank during normal operations. In such cases, rate of vapor evolution from the tank into the workroom is not dependent upon the factors listed in the table, but rather upon abnormalities of operating procedure, such as carry out of vapors from excessively fast action, dragout of liquid by entrainment in parts, contamination of solvent by water and other materials, or improper heat balance. When operating procedure is excellent, effective rate of evolution may be taken as 4. When operating procedures are average, the effective rate of evolution may be taken as 3. When operation is poor, a rate of 2 or 1 is indicated, depending upon observed conditions.

Note 2. Relative evaporation rate is determined according to the methods described by A. K. Doolittle in Industrial and Engineering Chemistry, vol. 27, p. 1169, (3) where time for 100—percent evaporation is as follows: Fast: 0-3 hours; Medium: 3-12 hours; Slow: 12-50 hours; Nil: more than 50 hours.

Note 3. Gassing means the formation by chemical or electrochemical action of minute bubbles of gas under the surface of the liquid in the tank and is generally limited to aqueous solutions.

(3) Ventilation. Where ventilation is used to control potential exposures to workers as defined in (2)(c) of this section, it shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the worker does not exist. Methods of ventilation are discussed in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960.

(4) Control requirements.

(a) Control velocities shall conform to Table 18 in all cases where the flow of air past the breathing or working zone of the operator and into the hoods is undisturbed by local environmental conditions, such as open windows, wall fans, unit heaters, or moving machinery.

(b) All tanks exhausted by means of hoods which;

(i) Project over the entire tank;

(ii) Are fixed in position in such a location that the head of the workman, in all his normal operating positions while working at the tank, is in front of all hood openings; and

(iii) Are completely enclosed on at least two sides, shall be considered to be exhausted through an enclosing hood.

(iv) The quantity of air in cubic feet per minute necessary to be exhausted through an enclosing hood shall be not less than the product of the control velocity times the net area of all openings in the enclosure through which air can flow into the hood.

TABLE 18
CONTROL VELOCITIES IN FEET PER MINUTE (F.P.M.) FOR UNDISTURBED LOCATIONS

Class (See Sub-paragraph (2) and Tables 16 and 17)	Enclosing hood (See Subparagraph (4)(ii))		Lateral exhaust ¹ (See Subparagraph (4)(iii))	Canopy hood ² (See Subparagraph (4)(iv))	
	One open side	Two open sides		Three open sides	Four open sides
A-1 and A-2	100	150	150	Do not use	Do not use
A-3 (Note ²), B-1, B-2, and C-1	75	100	100	125	175
B-3, C-2, and D-1 (Note ³)	65	90	75	100	150
A-4 (Note ²), C-3, and D-2 (Note ³)	50	75	50	75	125
B-4, C-4, D-3 (Note ³), and D-4	General room ventilation required.				

¹ See Table 19 for computation of ventilation rate.
² Do not use canopy hood for Hazard Potential A processes.
³ Where complete control of hot water is desired, design as next highest class.

(c) All tanks exhausted by means of hoods which do not project over the entire tank, and in which the direction of air movement into the hood or hoods is substantially horizontal, shall be considered to be laterally exhausted. The quantity of air in cubic feet per minute necessary to be laterally exhausted per square foot of tank area in order to maintain the required control velocity shall be determined from Table 19 for all variations in ratio of tank width (W) to tank length (L). The total quantity of air in cubic feet per minute required to be exhausted per tank shall be not less than the product of the area of tank surface times the cubic feet per minute per square foot of tank area, determined from Table 19.

(i) For lateral exhaust hoods over 42 inches wide, or where it is desirable to reduce the amount of air removed from the workroom, air supply slots or orifices shall be provided along the side or the center of the tank opposite from the exhaust slots. The design of such systems shall meet the following criteria:

- (A) The supply air volume plus the entrained air shall not exceed 50 percent of the exhaust volume.
- (B) The velocity of the supply airstream as it reaches the effective control area of the exhaust slot shall be less than the effective velocity over the exhaust slot area.
- (C) The vertical height of the receiving exhaust hood, including any baffle, shall not be less than one-quarter the width of the tank.
- (D) The supply airstream shall not be allowed to impinge on obstructions between it and the exhaust slot in such a manner as to significantly interfere with the performance of the exhaust hood.

TABLE 19
MINIMUM VENTILATION RATE IN CUBIC FEET OF AIR PER MINUTE PER SQUARE FOOT OF TANK AREA FOR LATERAL EXHAUST

Required minimum control velocity, f.p.m. (from Table)	C.f.m. per sq. ft. to maintain required minimum velocities at following ratios (tank width (W)/tank length (L)). ^{1 3}				
	0.0-0.09	0.1-0.24	0.25-0.49	0.5-0.99	1.0-2.0
Hood along one side or two parallel sides of tank when one hood is against a wall or baffle. ²					
Also for a manifold along tank centerline. ³					
50	50	60	75	90	100
75	75	90	110	130	150
100	100	125	150	175	200
150	150	190	225	260	300
Hood along one side or two parallel sides of free standing tank not against wall or baffle.					
50	75	90	100	110	125
75	110	130	150	170	190
100	150	175	200	225	250
150	225	260	300	340	375

¹ It is not practicable to ventilate across the long dimension of a tank whose ratio W/L exceeds 2.0.
 It is understandable to do so when W/L exceeds 1.0. For circular tanks with lateral exhaust along up the circumference use W/L= 1.0 for over one-half the circumference use W/L= 0.5.
² Baffle is a vertical plate the same length as the tank, and with the top of the plate as high as the tank is wide. If the exhaust hood is on the side of a tank against a building wall or close to it, it is perfectly baffled.
³ Use W/L as tank width in computing when manifold is along centerline, or when hoods are used on two parallel sides of a tank.

Tank Width (W) means the effective width over which the hood must pull air to operate (for example, where the hood face is not back from the edge of the tank, this set back must be added in measuring tank width). The surface area of tanks can frequently be reduced and better control obtained (particularly on conveyerized systems) by using covers extending from the upper edges of the slots toward the center of the tank.

(E) Since most failure of push-pull systems result from excessive supply air volumes and pressures, methods of measuring and adjusting the supply air shall be provided. When satisfactory control has been achieved, the adjustable features of the hood shall be fixed so that they will not be altered.

(d) All tanks exhausted by means of hoods which project over the entire tank, and which do not conform to the definition of enclosing hoods, shall be considered to be overhead canopy hoods. The quantity of air in cubic feet per minute necessary to be exhausted through a canopy hood shall be not less than the product of the control velocity times the net area of all openings between the bottom edges of the hood and the top edges of the tank.

(e) The rate of vapor evolution (including steam or products of combustion) from the process shall be estimated. If the rate of vapor evolution is equal to or greater than 10 percent of the calculated exhaust volume required, the exhaust volume shall be increased in equal amount.

(5) Spray cleaning and degreasing. Wherever spraying or other mechanical means are used to disperse a liquid above an open-surface tank, control must be provided for the airborne spray. Such operations shall be enclosed as completely as possible. The inward air velocity into the enclosure shall be sufficient to prevent the discharge of spray into the workroom. Mechanical baffles may be used to help prevent the

discharge of spray. Spray painting operations are covered in WAC 296-62-11019.

(6) Control means other than ventilation. Tank covers, foams, beads, chips, or other materials floating on the tank surface so as to confine gases, mists, or vapors to the area under the cover or to the foam, bead, or chip layer; or surface tension depressive agents added to the liquid in the tank to minimize mist formation, or any combination thereof, may all be used as gas, mist, or vapor control means for open-surface tank operations, provided that they effectively reduce the concentrations of hazardous materials in the vicinity of the worker below the limits set in accordance with (2) of this section.

(7) System design.

(a) The equipment for exhausting air shall have sufficient capacity to produce the flow of air required in each of the hoods and openings of the system.

(b) The capacity required in (7)(a) of this section shall be obtained when the airflow producing equipment is operating against the following pressure losses, the sum of which is the static pressure:

(i) Entrance losses into the hood.

(ii) Resistance to airflow in branch pipe including bends and transformations.

(iii) Entrance loss into the main pipe.

(iv) Resistance to airflow in main pipe including bends and transformations.

(v) Resistance of mechanical equipment; that is, filters, washers, condensers, absorbers, etc., plus their entrance and exit losses.

(vi) Resistance in outlet duct and discharge stack.

(c) Two or more operations shall not be connected to the same exhaust system where either one or the combination of the substances removed may constitute a fire, explosion, or chemical reaction hazard in the duct system. Traps or other devices shall be provided to insure that condensate in ducts does not drain back into any tank.

(d) The exhaust system, consisting of hoods, ducts, air mover, and discharge outlet shall be designed in accordance with American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960, or the manual, Industrial Ventilation, published by the American Conference of Governmental Industrial Hygienists. Airflow and pressure loss data provided by the manufacturer of any air cleaning device shall be included in the design calculations.

(8) Operation.

(a) The required airflow shall be maintained at all times during which gas, mist, or vapor is emitted from the tank, and at all times the tank, the draining, or the drying area is in operation or use. When the system is first installed, the airflow from each hood shall be measured by means of a pitot traverse in the exhaust duct and corrective action taken if the flow is less than that required. When the proper flow is obtained, the hood static pressure shall be measured and recorded. At intervals of not more than 3 months operation, or after a prolonged shutdown period, the hoods and duct system shall be inspected for evidence of corrosion or damage. In any case where the airflow is found to be less than required, it shall be increased to the required value. (Infor-

mation on airflow and static pressure measurement and calculations may be found in American National Standard Fundamentals Governing the Design and Operation of Local Exhaust Systems, Z9.2-1960, or in the manual, Industrial Ventilation, published by the American Conference of Governmental Industrial Hygienists.)

(b) The exhaust system shall discharge to the outer air in such a manner that the possibility of its effluent entering any building is at a minimum. Recirculation shall only be through a device for contaminant removal which will prevent the creation of a health hazard in the room or area to which the air is recirculated.

(c) A volume of outside air in the range of 90 percent to 110 percent of the exhaust volume shall be provided to each room having exhaust hoods. The outside air supply shall enter the workroom in such a manner as not to be detrimental to any exhaust hood. The airflow of the makeup air system shall be measured on installation. Periodically, thereafter, the airflow should be remeasured, and corrective action shall be taken when the airflow is below that required. The makeup air shall be uncontaminated.

(9) Personal protection.

(a) All employees working in and around open surface tank operations must be instructed as to the hazards of their respective jobs, and in the personal protection and first aid procedures applicable to these hazards.

(b) All persons required to work in such a manner that their feet may become wet shall be provided with rubber or other impervious boots or shoes, rubbers, or wooden-soled shoes sufficient to keep feet dry.

(c) All persons required to handle work wet with a liquid other than water shall be provided with gloves impervious to such a liquid and of a length sufficient to prevent entrance of liquid into the tops of the gloves. The interior of gloves shall be kept free from corrosive or irritating contaminants.

(d) All persons required to work in such a manner that their clothing may become wet shall be provided with such aprons, coats, jackets, sleeves, or other garments made of rubber, or of other materials impervious to liquids other than water, as are required to keep their clothing dry. Aprons shall extend well below the top of boots to prevent liquid splashing into the boots. Provision of dry, clean, cotton clothing along with rubber shoes or short boots and an apron impervious to liquids other than water shall be considered a satisfactory substitute where small parts are cleaned, plated, or acid dipped in open tanks and rapid work is required.

(e) Whenever there is a danger of splashing, for example, when additions are made manually to the tanks, or when acids and chemicals are removed from the tanks, the employees so engaged shall be required to wear either tight-fitting chemical goggles or an effective face shield. (See WAC 296-24-078.)

(f) When, during emergencies as described in (11)(e) of this section, employees must be in areas where concentrations of air contaminants are greater than the limit set by (2)(c) of this section or oxygen concentrations are less than 19.5%, they must be required to wear respirators adequate to reduce their exposure to a level below these limits or that provide adequate oxygen. Such respirators must also be provided in marked, quickly accessible storage compartments

built for the purpose, when there exists the possibility of accidental release of hazardous concentrations of air contaminants. Respirators must be certified by NIOSH under 42 CFR part 84 and used in accordance with the applicable provisions of chapter 296-62 WAC Part E.

(g) Near each tank containing a liquid which may burn, irritate, or otherwise be harmful to the skin if splashed upon the worker's body, there shall be a supply of clean cold water. The water pipe (carrying a pressure not exceeding 25 pounds) shall be provided with a quick opening valve and at least 48 inches of hose not smaller than three-fourths inch, so that no time may be lost in washing off liquids from the skin or clothing. Alternatively, deluge showers and eye flushes shall be provided in cases where harmful chemicals may be splashed on parts of the body.

(h) Operators with sores, burns, or other skin lesions requiring medical treatment shall not be allowed to work at their regular operations until so authorized by a physician. Any small skin abrasions, cuts, rash, or open sores which are found or reported shall be treated by a properly designated person so that chance of exposures to the chemicals are removed. Workers exposed to chromic acids shall have a periodic examination made of the nostrils and other parts of the body, to detect incipient ulceration.

(i) Sufficient washing facilities, including soap, individual towels, and hot water, shall be provided for all persons required to use or handle any liquids which may burn, irritate, or otherwise be harmful to the skin, on the basis of at least one basin (or its equivalent) with a hot water faucet for every 10 employees. (See WAC 296-24-12009.)

(j) Locker space or equivalent clothing storage facilities shall be provided to prevent contamination of street clothing.

(k) First aid facilities specific to the hazards of the operations conducted shall be readily available.

(10) Special precautions for cyanide. Dikes or other arrangements shall be provided to prevent the possibility of intermixing of cyanide and acid in the event of tank rupture.

(11) Inspection, maintenance, and installation.

(a) Floors and platforms around tanks shall be prevented from becoming slippery both by original type of construction and by frequent flushing. They shall be firm, sound, and of the design and construction to minimize the possibility of tripping.

(b) Before cleaning the interior of any tank, the contents shall be drained off, and the cleanout doors shall be opened where provided. All pockets in tanks or pits, where it is possible for hazardous vapors to collect, shall be ventilated and cleared of such vapors.

(c) Tanks which have been drained to permit employees to enter for the purposes of cleaning, inspection, or maintenance may contain atmospheres which are hazardous to life or health, through the presence of flammable or toxic air contaminants, or through the absence of sufficient oxygen. Before employees shall be permitted to enter any such tank, appropriate tests of the atmosphere shall be made to determine if the limits set by (2)(c) of this section are exceeded, or if the oxygen concentration is less than 19.5%.

(d) If the tests made in accordance with (11)(c) of this section indicate that the atmosphere in the tank is unsafe, before any employee is permitted to enter the tank, the tank

shall be ventilated until the hazardous atmosphere is removed, and ventilation shall be continued so as to prevent the occurrence of a hazardous atmosphere as long as an employee is in the tank.

(e) If, in emergencies, such as rescue work, it is necessary to enter a tank which may contain a hazardous atmosphere, suitable respirators, such as self-contained breathing apparatus; hose mask with blower, if there is a possibility of oxygen deficiency; or a gas mask, selected and operated in accordance with (9)(f) of this section, shall be used. If a contaminant in the tank can cause dermatitis, or be absorbed through the skin, the employee entering the tank shall also wear protective clothing. At least one trained standby employee, with suitable respirator, shall be present in the nearest uncontaminated area. The standby employee must be able to communicate with the employee in the tank and be well able to haul him out of the tank with a lifeline if necessary.

(f) Maintenance work requiring welding or open flame, where toxic metal fumes such as cadmium, chromium, or lead may be evolved, shall be done only with sufficient local exhaust ventilation to prevent the creation of a health hazard, or be done with respirators selected and used in accordance with (9)(f) of this section. Welding, or the use of open flames near any solvent cleaning equipment shall be permitted only after such equipment has first been thoroughly cleared of solvents and vapors.

(12) Vapor degreasing tanks.

(a) In any vapor degreasing tank equipped with a condenser and vapor level thermostat, the condenser or thermostat shall keep the level of vapors below the top edge of the tank by a distance at least equal to one-half the tank width, or at least 36 inches, whichever is shorter.

(b) Where gas is used as a fuel for heating vapor degreasing tanks, the combustion chamber shall be of tight construction, except for such openings as the exhaust flue, and those that are necessary for supplying air for combustion. Flues shall be of corrosion-resistant construction and shall extend to the outer air. If mechanical exhaust is used on this flue, a draft diverter shall be used. Special precautions must be taken to prevent solvent fumes from entering the combustion air of this or any other heater when chlorinated or fluorinated hydrocarbon solvents (for example, trichloroethylene; Freon) are used.

(c) Heating elements shall be so designed and maintained that their surface temperature will not cause the solvent or mixture to decompose, break down, or be converted into an excessive quantity of vapor.

(d) Tanks or machines of more than 4 square feet of vapor area, used for solvent cleaning or vapor degreasing, shall be equipped with suitable cleanout or sludge doors located near the bottom of each tank or still. These doors shall be so designed and gasketed that there will be no leakage of solvent when they are closed.

(13) Scope.

(a) This paragraph applies to all operations involving the immersion of materials in liquids, or in the vapors of such liquids, for the purpose of cleaning or altering their surfaces, or adding or imparting a finish thereto, or changing the character of the materials, and their subsequent removal from the

liquids or vapors, draining, and drying. Such operations include washing, electroplating, anodizing, pickling, quenching, dyeing, dipping, tanning, dressing, bleaching, degreasing, alkaline cleaning, stripping, rinsing, digesting, and other similar operations, but do not include molten materials handling operations, or surface coating operations.

(b) "Molten materials handling operations" means all operations, other than welding, burning, and soldering operations, involving the use, melting, smelting, or pouring of metals, alloys, salts, or other similar substances in the molten state. Such operations also include heat treating baths, descaling baths, die casting stereotyping, galvanizing, tinning, and similar operations.

(c) "Surface coating operations" means all operations involving the application of protective, decorative, adhesive, or strengthening coating or impregnation to one or more surfaces, or into the interstices of any object or material, by means of spraying, spreading, flowing, brushing, roll coating, pouring, cementing, or similar means; and any subsequent draining or drying operations, excluding open-tank operations.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-11021, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-62-11021, filed 11/22/91, effective 12/24/91. RCW 49.17.040, 49.17.050, and 49.17.240. 81-16-015 (Order 81-20), § 296-62-11021, filed 7/27/81; 80-11-010 (Order 80-14), § 296-62-11021, filed 8/8/80; Order 73-3, § 296-62-11021, filed 5/7/73.]

WAC 296-62-12000 Environmental tobacco smoke in office work environments—Scope and application. This regulation applies to all indoor office work environments and requires employee exposure to environmental tobacco smoke to be controlled.

[Statutory Authority: Chapter 49.17 RCW. 94-07-086 (Order 93-18), § 296-62-12000, filed 3/16/94, effective 9/1/94.]

WAC 296-62-12003 Definitions. (1) "CFM" means cubic feet per minute.

(2) "Employer" means any person, firm, corporation, partnership, business trust, legal representative, or other business entity which engages in any business, industry, profession, or activity in this state and employs one or more employees or who contracts with one or more persons, the essence of which is the personal labor of such person or persons and includes the state, counties, cities, and all municipal corporations, public corporations, political subdivisions of the state, and charitable organizations: Provided, That any persons, partnership, or business entity not having employees, and who is covered by the Industrial Insurance Act shall be considered both an employer and an employee.

(3) "Office work environment" means an indoor or enclosed occupied space where activities such as clerical, administration, or business are transacted. It includes associated spaces controlled by the employer that office workers utilize (e.g., cafeteria or meeting rooms). It does not include production or manufacturing process areas, but does include the office areas of manufacturing and production facilities. It includes only the office areas of other firms such as food and beverage establishments, agricultural operations, construction, commercial trade, services, etc.

[Title 296 WAC—p. 1762]

(4) "Smoking" means igniting, inhaling, exhaling, or carrying a pipe, cigar, or cigarette of any kind which is burning.

[Statutory Authority: Chapter 49.17 RCW. 94-07-086 (Order 93-18), § 296-62-12003, filed 3/16/94, effective 9/1/94.]

WAC 296-62-12005 Controls for environmental tobacco smoke. (1) Employers shall prohibit smoking in their office's entirety, or restrict smoking indoors to designated enclosed smoking rooms that satisfy the minimum requirements below:

(a) Designated smoking rooms shall be clearly posted.

(b) Designated smoking rooms shall be prohibited in common areas such as places where nonsmoking employees are required to work or visit, restrooms, washrooms, hallways, and stairways.

(c) No employee shall be required to enter a designated smoking room while smoking is occurring. Cleaning and maintenance work in a designated smoking room shall be conducted when no smokers are present.

(d) Designated smoking rooms shall be ventilated at rates of at least 60 cfm per smoker (calculated on the basis of the maximum number of smokers expected during the course of a normal working day), which can be supplied by transfer air from adjacent areas.

Note: This ventilation rate is recommended for occupancies of no more than seven people for every 100 square feet of net occupied space in the designated smoking room.

(e) Sufficient negative pressure shall be maintained in designated smoking rooms to prevent smoke migration to surrounding nonsmoking areas at all times.

(f) Designated smoking rooms shall operate with a separate mechanical exhaust system and be exhausted directly outside, without recirculation to nonsmoking areas.

(g) If the mechanical exhaust system for a designated smoking room is not operating properly, the employer shall prohibit the use of the room until repairs are completed.

Note: This regulation is not intended to affect structures provided for smokers such as gazebos or lean-tos external to a building that are intended to provide protection from inclement weather.

(2) The employer shall use engineering or administrative controls to minimize the infiltration of environmental tobacco smoke from sources outside the building, through air intakes, entryways, and other openings (e.g., by ensuring any outside smoking areas utilized by their employees are not in close proximity to entryways, air intakes, and other openings that may allow airflow directly into an office).

(3) This section does not preempt any federal, state, municipal, or other local authority's regulation of indoor smoking that is more protective than this section.

Note: WAC 296-62-12009, the appendix, contains smoking cessation program information sources.

[Statutory Authority: Chapter 49.17 RCW. 94-07-086 (Order 93-18), § 296-62-12005, filed 3/16/94, effective 9/1/94.]

WAC 296-62-12007 Effective date. The effective date of WAC 296-62-12000 through 296-62-12009 shall be September 1, 1994.

[Statutory Authority: Chapter 49.17 RCW. 94-07-086 (Order 93-18), § 296-62-12007, filed 3/16/94, effective 9/1/94.]

WAC 296-62-12009 Appendix—Smoking cessation program information—Nonmandatory. The following organizations* provide smoking cessation information and program material:

(1) The National Cancer Institute operates a toll-free Cancer Information Service (CIS) with trained personnel to help you. Call 1-800-4-CANCER to reach the CIS office serving your area, or write: Office of Cancer Communications, National Cancer Institute, National Institutes of Health, Building 31, Room 10A24, Bethesda, Maryland 20892.

(2) American Cancer Society, 1599 Clifton Road NE, Atlanta, Georgia 30062, (404) 320-3333. The American Cancer Society (ACS) is a voluntary organization composed of 58 divisions and 3,100 local units. Through "The Great American Smokeout" in November, the annual Cancer Crusade in April, and numerous educational material, ACS helps people learn about the health hazards of smoking and become successful ex-smokers.

(3) American Heart Association, 7320 Greenville Avenue, Dallas, Texas 75231, (214) 750-5300. The American Heart Association (AHA) is a voluntary organization with 130,000 members (physicians, scientists, and laypersons) in 55 state and regional groups. AHA produces a variety of publications and audiovisual materials about the effects of smoking on the heart. AHA also has developed a guidebook for incorporating a weight-control component into smoking cessation programs.

(4) American Lung Association, 1740 Broadway, New York, New York 10019, (212) 245-8000. A voluntary organization of 7,500 members (physicians, nurses and laypersons), the American Lung Association (ALA) conducts numerous public information programs about the health effect of smoking. ALA has 59 state and 85 local units. The organization actively supports legislation and information campaigns for nonsmokers' rights and provides help for smokers who want to quit, for example through "Freedom From Smoking," a self-help cessation program.

(5) Office on Smoking and Health, United States Department of Health and Human Services, 5600 Fishers Lane, Park Building, Room 110, Rockville, Maryland 20857. The Office of Smoking and Health (OSH) is the Department of Health and Human Services' lead agency in smoking control. OSH has sponsored distribution of publications on smoking-related topics, such as free flyers on relapse after initial quitting, helping a friend or family member quit smoking, the health hazards of smoking, and the effects of parental smoking on teenagers.

*Consult your local telephone directory for listing of local chapters.

[Statutory Authority: Chapter 49.17 RCW. 94-07-086 (Order 93-18), § 296-62-12009, filed 3/16/94, effective 9/1/94.]

WAC 296-62-130 Emergency washing facilities. (1) Definitions.

"Emergency washing facilities" means emergency showers, eyewashes, eye/face washes, hand-held drench hoses, or other similar units.

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"Corrosive" is a substance that can cause destruction of living tissue by chemical action, including acids with a pH of 2.5 or below or caustics with a pH of 11.0 or above.

"Strong irritant" means a chemical that is not corrosive, but causes a strong temporary inflammatory effect on living tissue by chemical action at the site of contact.

"Toxic chemical" means a chemical that produces serious injury or illness by absorption through any body surface.

(2) Facilities required.

(a) What requirements apply to accessing emergency washing facilities?

- Emergency washing facilities must be readily available and accessible.
- To be readily available and accessible, emergency washing facilities must be free of obstruction and require no more than ten seconds to reach.
- The travel distance should be no farther than fifty feet (15.25 meters).

(b) What requirements apply to emergency showers?

- Emergency showers must be provided if there is a potential for substantial portions of the body to come into contact with corrosives, strong irritants, or toxic chemicals.
- The emergency showers must deliver water to cascade over the user's entire body at a minimum rate of twenty gallons (75.7 liters) per minute for fifteen minutes or more.

(c) What requirements apply to emergency eyewash?

- Emergency eyewash must be provided where there is the potential for an employee's eyes to be exposed to corrosives, strong irritants, or toxic chemicals.
- The emergency eyewash equipment must irrigate and flush both eyes simultaneously while the operator holds the eyes open.
- The on-off valve must be activated in one second or less and must remain on without the use of the operator's hands until intentionally turned off.
- The emergency eyewash equipment must deliver at least 0.4 gallons (1.5 liters) of water per minute for fifteen minutes or more.

(d) What requirements apply to personal eyewash equipment?

- Personal eyewash units are portable, supplementary units that support plumbed units or self-contained units, or both, by delivering immediate flushing for less than fifteen minutes.
- Such units must deliver potable water or other medically approved eye flushing solution.
- Personal eyewash equipment may be used to supplement emergency washing facilities, however, they must not be used as a substitute.

(e) What are the requirements for hand-held drench hoses?

- Hand-held drench hoses are single-headed emergency washing devices connected to a flexible hose and can be used to irrigate and flush the face or other parts of the body.
- Hand-held drench hoses may be used to supplement emergency washing facilities, however, they must not be used as a substitute.
- Hand-held drench hoses must deliver at least 3.0 gallons (11.4 liters) of water per minute for fifteen minutes or more.

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(f) What periodic inspection requirements apply to plumbed and self-contained washing equipment?

- All plumbed emergency eyewash facilities and hand-held drench hoses must be activated weekly and inspected annually to ensure that they function correctly and that the quality and quantity of water is satisfactory for emergency washing purposes.
- Emergency showers must be activated and inspected annually to ensure that they function correctly and that the quality and quantity of water is satisfactory for emergency washing purposes.
- All self-contained eyewash equipment and personal eyewash equipment must be inspected and maintained according to manufacturer instructions. Inspections for proper operation must be done annually. Sealed personal eyewashes must be replaced after the manufacturer's expiration date.

Note: Most manufacturers recommend fluid replacement every six months in self-contained eyewashes. The ANSI Standard can be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

(3) Potable water. All emergency washing facilities using nonpotable water must have signs stating the water is nonpotable.

Note: For further information on the design, installation, and maintenance of emergency washing facilities, see American National Standards Institute (ANSI) publication Z358.1 - 1998, Emergency Eyewash and Shower Equipment. Emergency washing facilities that are designed to meet ANSI Z358.1 - 1998 also meet the requirements of this standard. The ANSI Standard can be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018.

[Statutory Authority: RCW 49.17.040, 99-07-063, § 296-62-130, filed 3/17/99, effective 6/17/99. Statutory Authority: RCW 49.17.040 and 49.17.050, 85-10-004 (Order 85-09), § 296-62-130, filed 4/19/85; Order 73-3, § 296-62-130, filed 5/7/73; Order 70-8, § 296-62-130, filed 7/31/70, effective 9/1/70; Rule 13.010, effective 8/1/63.]

PART M—CONFINED SPACES

WAC 296-62-141 Permit-required confined spaces.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-22-046, § 296-62-141, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14100 Scope and application. (1) Scope. This part contains minimum requirements for practices and procedures to protect employees in all industries from the hazards of entry and/or work in permit-required confined spaces.

(2) Application. Part M (Permit-required confined spaces) applies to all employers under the jurisdiction of the Washington Industrial Safety and Health Act, chapter 49.17 RCW. Part M may be augmented by more protective requirements for confined spaces or areas in vertical standards. Certain industry specific vertical standards are more protective than chapter 296-62 WAC, Part M. Where there is a conflict between an industry specific vertical standard and chapter 296-62 WAC, Part M, the vertical standard will apply.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-22-046, § 296-62-14100, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14105 Definitions. "Acceptable entry conditions" means the conditions that must exist in a permit

space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

"Attendant" means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

"Authorized entrant" means an employee who is authorized by the employer to enter a permit space.

"Blanking or blinding" means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore. It is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

"Confined space" means a space that:

- Is large enough and so configured that an employee can bodily enter and perform assigned work; and

- Has limited or restricted means for entry or exit (For example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and

- Is not designed for continuous employee occupancy.

"Double block and bleed" means the closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

"Emergency" means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

"Engulfment" means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be inhaled to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

"Entry" means the action by which a person passes through an opening into a permit-required confined space and includes work activities in that space. Entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Note: If the opening is large enough for the worker to fully enter the space a permit is required even for partial body entry. Permits are not required for partial body entry where the opening is not large enough for full entry, although other standards such as lockout-tagout or respiratory protection may apply.

"Entry permit (permit)" means the written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in WAC 296-62-14509.

"Entry supervisor" means the person (such as the employer, crew leader, or crew chief) responsible for:

- Determining if acceptable entry conditions are present at a permit space where entry is planned;
- Authorizing entry and overseeing entry operations; and
- Terminating entry as required by this part.

Note: An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of entry supervisor may be passed

from one individual to another during the course of an entry operation.

"Hazardous atmosphere" means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of ten percent of its lower flammable limit (LFL);
- Airborne combustible dust at a concentration that meets or exceeds its LFL;

Note: This concentration may be approximated as a condition in which the dust obscures vision at a distance of five feet (1.52 m) or less.

- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;
- Atmospheric concentration of any substance which may exceed a permissible exposure limit is published in chapter 296-62 WAC, Parts F, G, H, and I, general occupational health standards;

Note: An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

- Any other atmospheric condition that is immediately dangerous to life or health.

Note: For air contaminants for which WISHA has not determined a dose or permissible exposure limit, other sources of information, such as material safety data sheets that comply with the Hazard Communication Standard, chapter 296-62 WAC, Part C, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

"Hot work permit" means the employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

"Immediately dangerous to life or health (IDLH)" means any condition that:

- Poses an immediate or delayed threat to life; or
- Would cause irreversible adverse health effects; or
- Would interfere with an individual's ability to escape unaided from a permit space.

Note: Some materials - hydrogen fluoride gas and cadmium vapor, for example - may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

"Inerting" means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

Note: This procedure produces an IDLH oxygen-deficient atmosphere.

"Isolation" means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: Blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system;

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lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

"Line breaking" means the intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

"Nonpermit confined space" means a confined space that does not contain any physical hazards or any actual or potential atmospheric hazards capable of causing death or serious physical harm.

"Oxygen deficient atmosphere" means an atmosphere containing less than 19.5 percent oxygen by volume.

"Oxygen enriched atmosphere" means an atmosphere containing more than 23.5 percent oxygen by volume.

"Permit-required confined space (permit space)" means a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard.

"Permit-required confined space program (permit space program)" means the employer's overall program for:

- Controlling, and, where appropriate, for protecting employees from, permit space hazards; and
- Regulating employee entry into permit spaces.

"Permit system" means the employer's written procedure for:

- Preparing and issuing permits for entry; and
- Returning the permit space to service following termination of entry.

"Prohibited condition" means any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

"Rescue service" means the personnel designated to rescue employees from permit spaces.

"Retrieval system" means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for nonentry rescue of persons from permit spaces.

"Testing" means the process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

Note: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14105, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14110 General requirements. (1) The employer must evaluate the workplace to determine if confined spaces are present. A confined space must be assumed

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to be a permit-required space unless it can be documented to be a nonpermit-confined space as required in subsection (2) of this section.

Note: Proper application of the decision flow chart in WAC 296-62-14171, Appendix A, would facilitate compliance with this requirement.

(2) A confined space may be classified as a nonpermit-confined space under the following conditions and procedures:

(a) If the confined space poses no actual or potential atmospheric hazards.

(b) If the confined space has no other recognized health or safety hazards including engulfment in solid or liquid material, electrical shock, or moving parts.

(c) If all hazards within the space are eliminated without entry into the space, the confined space may be classified as a nonpermit confined space for as long as the hazards remain eliminated.

(d) If it is necessary to enter the confined space to eliminate hazards, it must be assumed to be a permit space and such entry must be performed under WAC 296-62-14115 through 296-62-14150. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a nonpermit confined space for as long as the hazards remain eliminated.

Note: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. Subsections (6) and (7) of this section cover permit space entry where the employer can demonstrate that forced air ventilation alone will control all hazards in the space.

(e) The employer must:

(i) Document that all hazards in a permit space have been eliminated, through a certification that contains the date, the location of the space, and the signature of the person making the determination.

(ii) Make the certification available to each employee entering the space or to that employee's authorized representative.

(f) When there are changes in the use or configuration of a nonpermit confined space that might increase the hazards to entrants, the employer must reevaluate that space and, if necessary, reclassify it as a permit-required confined space.

(g) If hazards arise within a confined space that has been classified as a nonpermit space under this subsection, each employee in the space must exit the space. The employer must then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with chapter 296-62 WAC, Part M.

(3) If the workplace contains permit-required confined spaces, the employer must inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the permit spaces.

Note: A sign reading "DANGER-PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" or using other similar language would satisfy the requirement for a sign.

(4) If the employer decides that its employees will not enter permit spaces, the employer must:

- Take effective measures to prevent its employees from entering the permit spaces; and
- Comply with subsections (1), (3), and (8) of this section.

(5) If the employer decides that its employees will enter permit spaces, the employer must:

(a) Follow the procedures outlined in WAC 296-62-14115 through 296-62-14155; and

(b) Develop and implement a written permit space program that complies with this part; and

(c) Make the written program available for inspection by employees and their authorized representatives.

(6) An employer may use the alternate entry procedures specified in subsection (7) of this section for entering a permit space under the following conditions:

(a) The employer can demonstrate that the only hazard posed by the permit space is an actual or potential hazardous atmosphere;

(b) The employer can demonstrate that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry;

(c) The employer develops or has monitoring and inspection data that supports the demonstrations required by (a) and (b) of this subsection;

(d) If an initial entry of the permit space is necessary to obtain the data required by (c) of this subsection, the entry must be performed in compliance with the permit required confined space procedures outlined in WAC 296-62-14115 through 296-62-14150; and

(e) The determinations and supporting data required by (a), (b), and (c) of this subsection are documented by the employer and are made available to each employee who enters the permit space or to that employee's authorized representative.

(7) Alternate procedures for entering permit confined spaces.

The following alternate procedures apply to entry into permit spaces that meet the conditions set forth in subsection (6) of this section.

(a) During permit space entry using these alternate procedures an employer need not comply with WAC 296-62-14115 through 296-62-14125 and WAC 296-62-14135 through 296-62-14150. Training and employee participation requirements of WAC 296-62-14130 and 296-62-14155 still apply.

(b) Any conditions making it unsafe to remove an entrance cover must be eliminated before the cover is removed.

(c) When entrance covers are removed, the opening must be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and will protect each employee working in the confined space from objects falling into the space.

(d) Before an employee enters the confined space, the internal atmosphere must be tested, with a calibrated direct-reading instrument, for the following conditions in the order given below:

Any employee who enters the space, or that employee's authorized representative, must be provided an opportunity to observe the preentry testing required by this paragraph.

- (i) Oxygen content,
 - (ii) Flammable gases and vapors, and
 - (iii) Potential toxic air contaminants.
- (e) There must be no hazardous atmosphere within the space whenever any employee is inside the space.

(f) Continuous forced air ventilation must be used, as follows:

- (i) An employee must not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;
- (ii) The forced air ventilation must:
 - Be directed to ventilate the immediate areas where an employee is or will be present within the space; and
 - Continue until all employees have left the space;
- (iii) The air supply for the forced air ventilation must be from a clean source and may not increase the hazards in the space.

(g) The atmosphere within the space must be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. Any employee who enters the space, or that employee's authorized representative, shall be provided with an opportunity to observe the periodic testing required by this subsection.

- (h) If a hazardous atmosphere is detected during entry:
 - (i) Each employee must leave the space immediately;
 - (ii) The space must be evaluated to determine how the hazardous atmosphere developed; and

(iii) Measures must be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.

- (i) The employer must verify that:
 - The space is safe for entry; and
 - The preentry measures required by (a), (b), and (c) of this subsection have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification is made before entry and available to each employee entering the space.

(8) When an employer (host employer) arranges to have employees of another employer (contractor) perform work that involves permit space entry, the host employer must:

(a) Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements of this standard;

(b) Inform the contractor of the hazards identified and the host employer's experience with each permit space to be entered;

(c) Inform the contractor of any precautions or procedures that the host employer requires for the protection of employees in or near permit spaces where contractor personnel will be working;

(d) Coordinate entry operations with the contractor, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by WAC 296-62-14115(11); and

(e) Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

(9) In addition to complying with the permit space requirements that apply to all employers, each contractor who is retained to perform permit space entry operations must:

(a) Obtain any available information regarding permit space hazards and entry operations from the host employer;

(b) Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by WAC 296-62-14115(11); and

(c) Inform the host employer either through a debriefing or during the entry operation of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14110, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14115 Permit-required confined space program (permit space program). When the employer decides employees will enter a permit-required confined space, the employer must:

(1) Implement the measures necessary to prevent unauthorized entry;

(2) Identify and evaluate the hazards of permit spaces before employees enter them;

(3) Develop and implement the means, procedures, and practices necessary for safe permit space entry operations, including, but not limited to, the following:

(a) Specify acceptable entry conditions;

(b) Provide each authorized entrant or that employee's authorized representative with the opportunity to observe any monitoring or testing of permit spaces;

(c) Isolate the permit space;

(d) Purge, inert, flush, or ventilate the permit space as necessary to eliminate or control atmospheric hazards;

(e) Provide pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards; and

(f) Verify that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.

(4) Provide the following equipment (specified in (a) through (i) of this subsection) at no cost to employees, maintain that equipment properly, and ensure that employees use that equipment properly:

(a) Testing and monitoring equipment needed to comply with subsection (5) of this section;

(b) Ventilating equipment needed to obtain acceptable entry conditions;

(c) Communications equipment necessary for compliance with WAC 296-62-14135(3) and 296-62-14140(5);

(d) Personal protective equipment when feasible engineering and work practice controls will not adequately protect employees;

(e) Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;

(f) Barriers and shields as required by subsection (3)(d) of this section;

(g) Equipment, such as ladders, needed for safe entry and exit by authorized entrants;

(h) Rescue and emergency equipment needed to comply with subsection (9) of this section, except when the equipment is provided by rescue services; and

(i) Any other equipment necessary for safe entry into and rescue from permit spaces.

(5) Evaluate permit space conditions as follows when entry operations are conducted:

(a) Test conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin;

(b) If isolation of the space is infeasible because the space is large or is part of a continuous system (such as a sewer), preentry testing shall be performed to the extent feasible before entry is authorized. If entry is authorized, entry conditions shall be continuously monitored in the areas where authorized entrants are working;

(c) Test or monitor the permit space as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations;

(d) When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors;

(e) Provide each authorized entrant or that employee's authorized representative an opportunity to observe the preentry and any subsequent testing or monitoring of permit spaces;

(f) Reevaluate the permit space in the presence of any authorized entrant or that employee's authorized representative who requests that the employer conduct such reevaluation because the entrant or representative has reason to believe that the evaluation of that space may not have been adequate; and

(g) Immediately provide each authorized entrant or that employee's authorized representative with the results of any testing conducted in accord with this section.

Note: Atmospheric testing conducted in accordance with WAC 296-62-14172, Appendix B, would be considered as satisfying the requirements of this paragraph. For permit space operations in sewers, atmospheric testing conducted in accordance with Appendix B, as supplemented by WAC 296-62-14175, Appendix E, would be considered as satisfying the requirements of this subdivision.

(6) Provide at least one attendant outside the permit space into which entry is authorized during entry operations;

Note: Attendants may be assigned to monitor more than one permit space provided the duties described in WAC 296-62-14140 can be effectively performed for each permit space that is monitored. Likewise, attendants may be stationed at any location outside the permit space to be monitored as long as the duties described in WAC 296-62-14140 can be effectively performed for each permit space that is monitored. However, it is important to assess if it is appropriate or possible to have multiple permit spaces monitored by a single attendant or have attendants stationed at a location outside the monitored permit space. Due to the variability of permit space work environments, the appropriateness of how a permit space is monitored should be tailored to the requirements of the permit space and the work being performed.

(7) If multiple spaces are to be monitored by a single attendant, include in the permit program the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored

without distraction from the attendant's responsibilities under WAC 296-62-14140;

(8) Designate the persons who are to have active roles (for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations, identify the duties of each such employee, and provide each such employee with the training required by WAC 296-62-14130;

(9) Develop and implement procedures for:

- Summoning rescue and emergency services;
- Rescuing entrants from permit spaces;
- Providing necessary emergency services to rescued employees; and
- Preventing unauthorized personnel from attempting a rescue;

(10) Develop and implement a system for the preparation, issuance, use, and cancellation of entry permits as required by this part;

(11) Develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so they do not endanger each other;

(12) Develop and implement procedures (such as closing off a permit space and canceling the permit) to end the entry after entry operations have been completed;

(13) Review entry operations when the employer has reason to believe that the measures taken under the permit space program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized; and

Note: Examples of circumstances requiring the review of the permit space program are: Any unauthorized entry of a permit space, the detection of a permit space hazard not covered by the permit, the detection of a condition prohibited by the permit, the occurrence of an injury or near-miss during entry, a change in the use or configuration of a permit space, and employee complaints about the effectiveness of the program.

(14) Review the permit space program, using the canceled permits retained under WAC 296-62-14120(6) within one year after each entry and revise the program as necessary, to ensure that employees participating in entry operations are protected from permit space hazards.

Note: Employers may perform a single annual review covering all entries performed during a twelve-month period. If no entry is performed during a twelve-month period, no review is necessary.

Note: WAC 296-62-14173, Appendix C, presents examples of permit space programs that are considered to comply with the requirements of WAC 296-62-14115.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14115, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14120 Permit system. (1) Before entry is authorized, the employer must document the completion of measures required by WAC 296-62-14115(3) by preparing an entry permit.

Note: WAC 296-62-14174, Appendix D, presents examples of permits whose elements are considered to comply with the requirements of this part.

(2) Before entry begins, the entry supervisor identified on the permit must sign the entry permit to authorize entry.

(3) The completed permit must be made available at the time of entry to all authorized entrants or their authorized representatives, by posting it at the entry portal or by any other equally effective means, so that the entrants can confirm that preentry preparations have been completed.

(4) The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit in accordance with WAC 296-62-14125(2).

(5) The entry supervisor must terminate entry and cancel the entry permit when:

(a) The entry operations covered by the entry permit have been completed; or

(b) A condition that is not allowed under the entry permit arises in or near the permit space.

(6) The employer must retain each canceled entry permit for at least one year to facilitate the review of the permit-required confined space program required by WAC 296-62-14115(14). Any problems encountered during an entry operation must be noted on the pertinent permit so that appropriate revisions to the permit space program can be made.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14120, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14125 Required entry permit information. The entry permit that documents compliance with this standard and authorizes entry to a permit space must identify the following:

- (1) The permit space to be entered;
- (2) The purpose of the entry;
- (3) The date and the authorized duration of the entry permit;
- (4) The authorized entrants within the permit space, by name or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space;

Note: This requirement may be met by inserting a reference on the entry permit as to the means used, such as a roster or tracking system, to keep track of the authorized entrants within the permit space.

(5) The personnel, by name, currently serving as attendants;

(6) The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry;

(7) The hazards of the permit space to be entered;

(8) The measures used to isolate the permit space and to eliminate or control permit space hazards before entry;

Note: Those measures can include the lockout or tagging of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces.

(9) The acceptable entry conditions;

(10) The results of initial and periodic tests performed under WAC 296-62-14115(5), accompanied by the names or initials of the testers and by an indication of when the tests were performed;

(11) The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services;

(12) The communication procedures used by authorized entrants and attendants to maintain contact during the entry;

(13) Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this part;

(14) Any other necessary information, given the circumstances of the particular confined space, in order to ensure employee safety; and

(15) Any additional permits, such as for hot work, that have been issued to authorize work in the permit space.

Note: See WAC 296-62-14174, Appendix D, for a sample entry permit form.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14125, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14130 Training. (1) The employer must provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this standard.

(2) Training must be provided to each affected employee in the following instances:

(a) Before the employee is first assigned duties under this section;

(b) Before there is a change in assigned duties;

(c) Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained;

(d) Whenever the employer has reason to believe that:

- There are deviations from the permit space entry procedures required by WAC 296-62-14115(3); or
- There are inadequacies in the employee's knowledge or use of these procedures.

(3) The training must establish employee proficiency in the duties required by this standard and must introduce new or revised procedures, as necessary, for compliance with this part.

(4) The employer must certify that the training required by subsections (1) through (3) of this section has been accomplished. The certification must:

- Contain each employee's name, the signatures or initials of the trainers, and the dates of training;
- Be available for inspection by employees and their authorized representatives.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14130, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14135 Duties of authorized entrants. The employer must ensure that all authorized entrants:

(1) Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

(2) Properly use equipment as required by WAC 296-62-14115(4);

(3) Communicate with the attendant as necessary to enable the attendant to:

- Monitor entrant status; and
- Alert entrants of the need to evacuate the space as required by WAC 296-62-14140(6);

(4) Alert the attendant whenever:

- (a) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation; or
- (b) The entrant detects a prohibited condition; and
- (5) Exit from the permit space as quickly as possible whenever:

- (a) An order to evacuate is given by the attendant or the entry supervisor;
- (b) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation;
- (c) The entrant detects a prohibited condition; or
- (d) An evacuation alarm is activated.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14135, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14140 Duties of attendants. The employer must ensure that each attendant:

- (1) Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- (2) Is aware of possible behavioral effects of hazard exposure in authorized entrants;
- (3) Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants under WAC 296-62-14125(4) accurately identifies who is in the permit space;
- (4) Remains outside the permit space during entry operations until relieved by another attendant;

Note: When the employer's permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations as required by WAC 296-62-14150(1) and if they have been relieved as required by subsection (4) of this section.

(5) Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space under subsection (6) of this section;

(6) Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:

- (a) If the attendant detects a prohibited condition;
- (b) If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;
- (c) If the attendant detects a situation outside the space that could endanger the authorized entrants; or
- (d) If the attendant cannot effectively and safely perform all the duties required under this section;

(7) Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;

(8) Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:

- (a) Warn the unauthorized persons that they must stay away from the permit space;
- (b) Tell the unauthorized persons that they must exit immediately if they have entered the permit space; and
- (c) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;

(9) Performs nonentry rescues as specified by the employer's rescue procedure; and

(10) Performs no other duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14140, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14145 Duties of entry supervisors. The employer must ensure that each entry supervisor:

(1) Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

(2) Verifies, by checking:

- That the appropriate entries have been made on the permit;
- That all tests specified by the permit have been conducted; and
- That all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;

(3) Terminates the entry and cancels the permit as required by WAC 296-62-14120(5);

(4) Verifies that rescue services are available and that the means for summoning them are operable;

(5) Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and

(6) Determines that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained. This determination must be made whenever responsibility for a permit space entry operation is transferred and at regular intervals dictated by the hazards and operations performed within space.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14145, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14150 Rescue and emergency services.

(1) An employer who designates rescue and emergency services, under WAC 296-62-14115(9) of this part must:

(a) Evaluate a prospective rescuer's ability to respond to a rescue summons in a timely manner, considering the hazard(s) identified;

Note: What will be considered timely will vary according to the specific hazards involved in each entry. For example, chapter 296-62 WAC, Part E, Respiratory protection, requires that employers provide a standby person or persons capable of immediate action to rescue employee(s) wearing respiratory protection while in work areas defined as IDLH atmospheres.

(b) Evaluate a prospective rescue service's ability, in terms of proficiency with rescue-related tasks and equipment, to function appropriately while rescuing entrants from the particular permit space or types of permit spaces identified;

(c) Select a rescue team or service from those evaluated that:

(i) Has the capability to reach the victim(s) within a time frame that is appropriate for the permit space hazard(s) identified;

(ii) Is equipped for and proficient in performing the needed rescue services;

(d) Inform each rescue team or service of the hazards they may confront when called on to perform rescue at the site; and

(e) Provide the rescue team or service with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations.

Note: Nonmandatory WAC 296-62-14176, Appendix F, contains examples of criteria which employers can use in evaluating prospective rescue services.

(2) An employer whose employees have been designated to provide permit space rescue and emergency services must take the following measures.

(a) Provide affected employees with the personal protective equipment (PPE) needed to conduct permit space rescues safely and train affected employees so they are proficient in the use of that PPE, at no cost to those employees;

(b) Train affected employees to perform assigned rescue duties. The employer must ensure that such employees successfully complete the training required to establish proficiency as an authorized entrant, as provided by WAC 296-62-14130 and 296-62-14135;

(c) Train affected employees in basic first-aid and cardiopulmonary resuscitation (CPR). The employer must ensure that at least one member of the rescue team or service holding a current certification in first-aid and CPR is available; and

(d) Ensure that affected employees practice making permit space rescues at least once every twelve months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces. These representative permit spaces must, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

(3) Nonentry rescue. To facilitate nonentry rescue, retrieval systems or methods must be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Retrieval systems must meet the following requirements.

(a) Each authorized entrant must use a chest or full-body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head or at another point which the employer can establish presents a profile small enough for the successful removal of the entrant.

(b) Wristlets may be used in lieu of the chest or full-body harness if the employer can demonstrate that the use of a chest or full-body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.

(c) The other end of the retrieval line must be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.

(d) A mechanical device must be available to retrieve personnel from vertical type permit spaces more than five feet (1.52 m) deep.

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(4) If an injured entrant is exposed to a substance for which a material safety data sheet (MSDS) or other similar written information is required to be kept at the worksite, that MSDS or written information must be made available to the medical facility treating the exposed entrant.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14150, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14155 Employee participation. (1) Employers must consult with affected employees and their authorized representatives on the development and implementation of all aspects of the permit space program required by WAC 296-62-14503.

(2) Employers must make available to affected employees and their authorized representatives all information required to be developed by this part.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14155, filed 10/29/99, effective 2/1/00.]

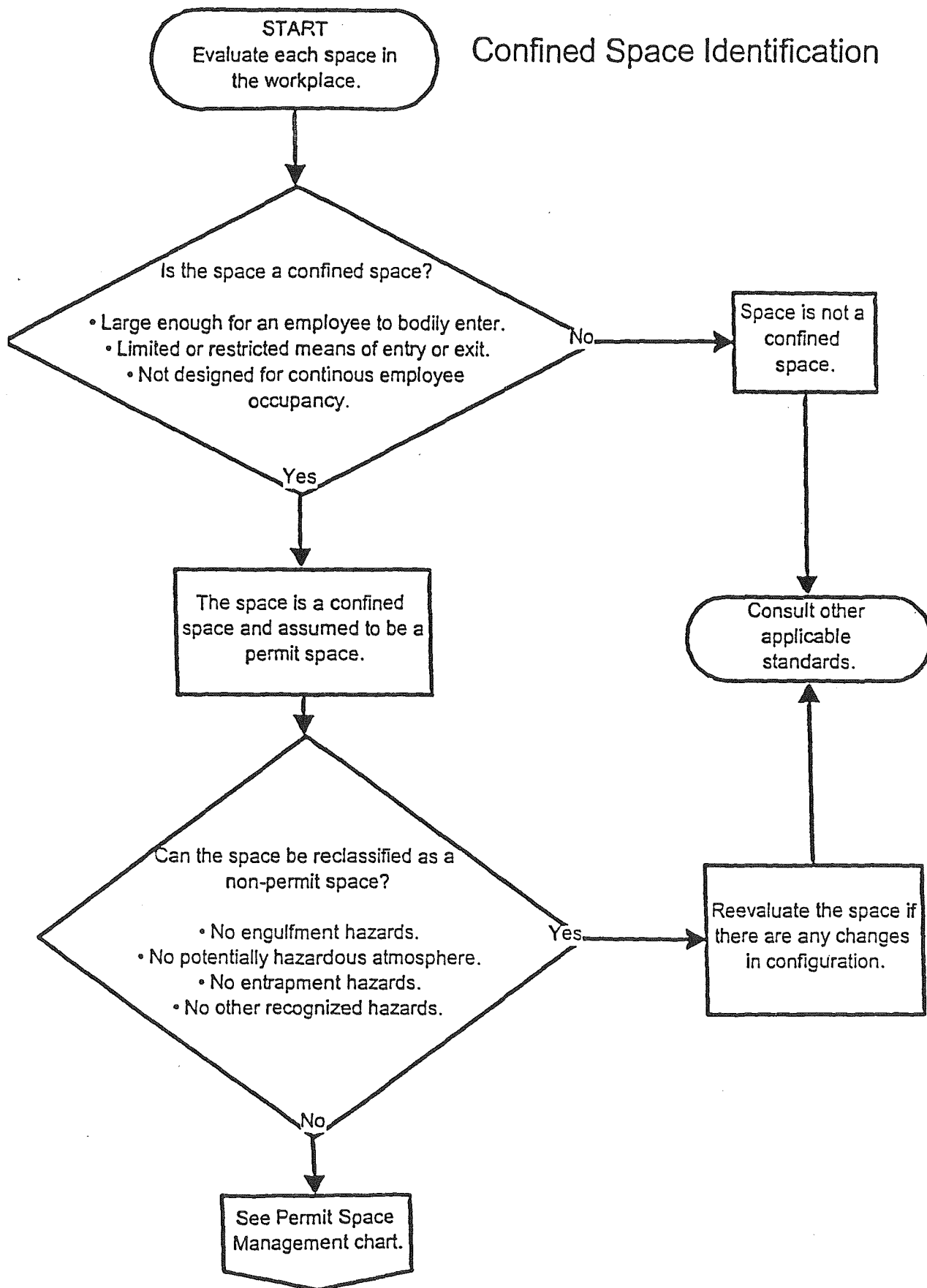
WAC 296-62-14170 Appendices to WAC 296-62-141—Permit-required confined spaces.

Note: Appendices A through F serve to provide information and nonmandatory guidelines to assist employers and employees in complying with the appropriate requirements of this part.

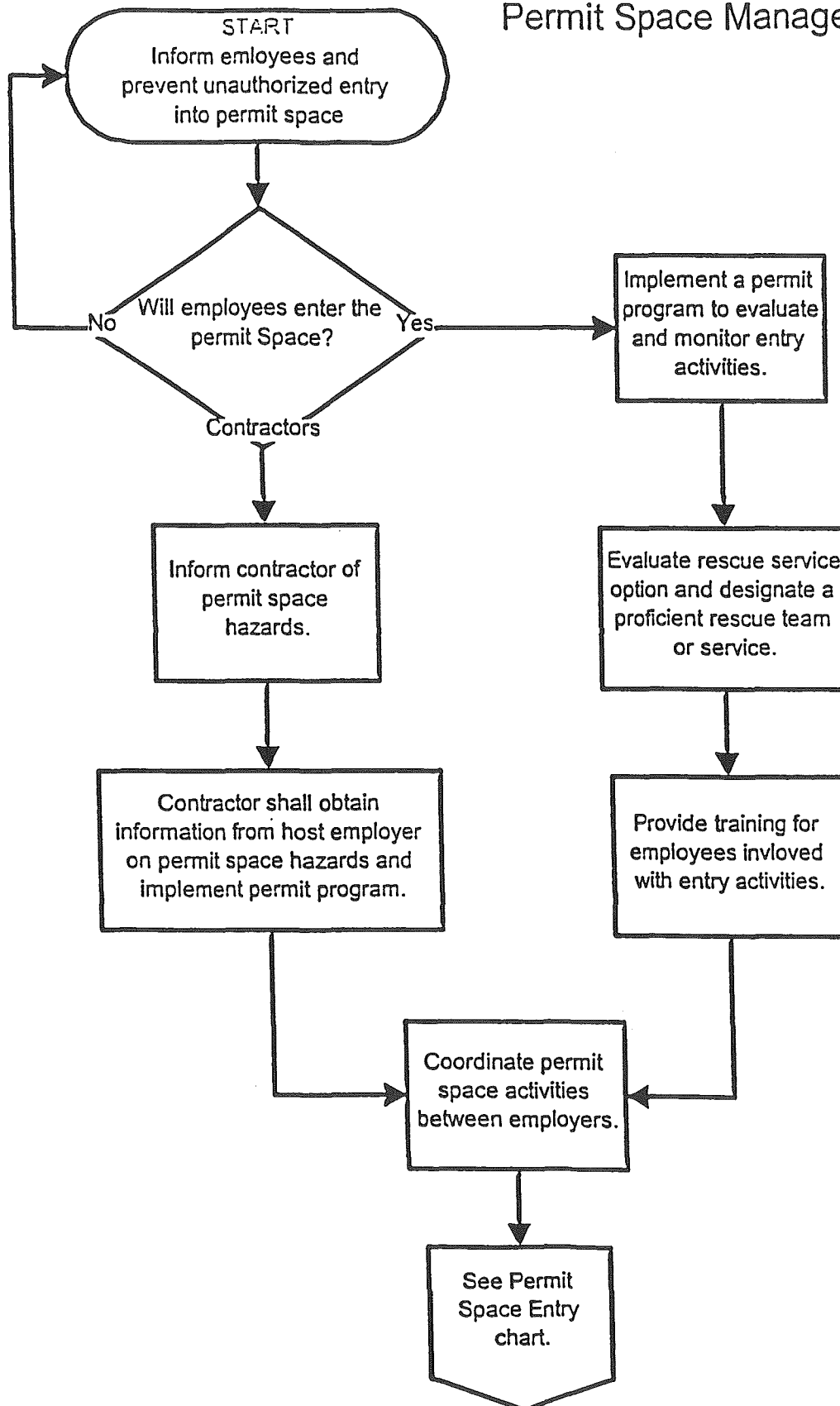
[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14170, filed 10/29/99, effective 2/1/00.]

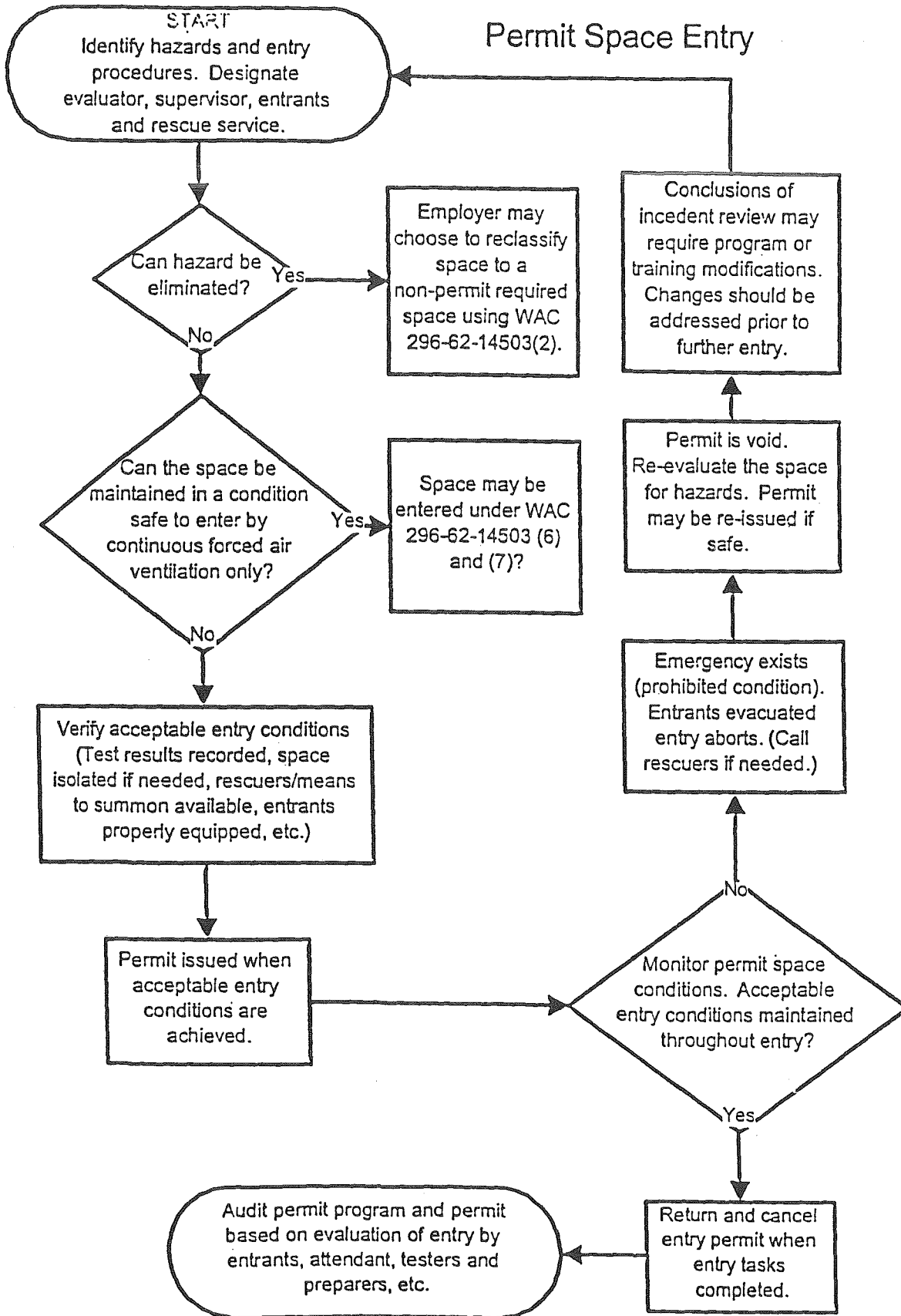
WAC 296-62-14171 Appendix A—Permit-required confined space decision flow chart.

Confined Space Identification



Permit Space Management





WAC 296-62-14172 Appendix B—Procedures for atmospheric testing. Atmospheric testing is required for two distinct purposes:

- Evaluation of the hazards of the permit space; and
- Verification that acceptable entry conditions into that space exist.

(1) Evaluation testing.

• The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space.

• Evaluation and interpretation of these data, and development of the entry procedure, should be done by, or reviewed by, a technically qualified professional (e.g., WISHA consultation service, or certified industrial hygienist, registered safety engineer, certified safety professional, certified marine chemist, etc.) based on evaluation of all serious hazards.

(2) Verification testing.

• The atmosphere of a permit space which may contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit specified equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions.

• Results of testing (i.e., actual concentration, etc.) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

(3) Duration of testing. Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified by the manufacturer.

(4) Testing stratified atmospheres.

• When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested a distance of approximately four feet (1.22 m) in the direction of travel and to each side.

• If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.

(5) Order of testing.

• A test for oxygen is performed first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere.

• Combustible gases are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapors.

• If tests for toxic gases and vapors are necessary, they are performed last.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-22-046, § 296-62-14172, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14173 Appendix C—Examples of permit-required confined space programs. Example 1. Workplace. Sewer entry.

(1) Potential hazards. The employees could be exposed to the following:

(a) Engulfment.

(b) Presence of toxic gases. Equal to or more than 10 ppm hydrogen sulfide measured as an eight-hour time-weighted average. If the presence of other toxic contaminants is suspected, specific monitoring programs will be developed.

(c) Presence of explosive/flammable gases. Equal to or greater than ten percent of the lower flammable limit (LFL).

(d) Oxygen deficiency. A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume.

(2) Entry without permit/attendant:

(a) Certification.

• Sewers may be entered without the need for a written permit or attendant provided that the space can be maintained in a safe condition for entry by mechanical ventilation alone, as provided in WAC 296-62-14110(5).

• All sewers must be considered permit-required confined spaces until the preentry procedures demonstrate otherwise.

• Any employee required or permitted to precheck or enter a sewer must have successfully completed, as a minimum, the training as required by the following sections of these procedures.

• A written copy of operating and rescue procedures as required by these procedures must be at the worksite for the duration of the job.

• The sewer preentry checklist must be completed by the LEAD WORKER before entry into a sewer. This list verifies completion of items listed below. This checklist must be kept at the job site for duration of the job.

• If circumstances dictate an interruption in the work, the sewer must be reevaluated and a new checklist must be completed.

(b) Control of atmospheric and engulfment hazards.

(i) Pumps and lines.

• All pumps and lines which may reasonably cause contaminants to flow into the sewer must be disconnected, blinded and locked out, or effectively isolated by other means to prevent development of dangerous air contamination or engulfment.

• Not all laterals to sewers or storm drains require blocking. However, where experience or knowledge of industrial use indicates there is a reasonable potential for contamination of air or engulfment into an occupied sewer, then all affected laterals must be blocked.

• If blocking and/or isolation requires entry into the sewer the provisions for entry into a permit-required confined space must be implemented.

(ii) Surveillance. The surrounding area must be surveyed to avoid hazards such as drifting vapors from the tanks, piping, or sewers.

(iii) Testing.

• The atmosphere within the sewer will be tested to determine whether dangerous air contamination and/or oxygen deficiency exists.

• Detector tubes, alarm only gas monitors and explosion meters are examples of monitoring equipment that may be used to test sewer atmospheres.

- Testing must be performed by a LEAD WORKER who has successfully completed the gas detector training for the monitoring method to be used.

- The minimum parameters to be monitored are oxygen deficiency, LFL, and hydrogen sulfide concentration.

- A written record of the preentry test results must be made and kept at the worksite for the duration of the job.

- The supervisor will certify in writing, based upon the results of the preentry testing, that all hazards have been eliminated or controlled.

- Affected employees must be able to review the testing results.

- The most hazardous conditions will govern when work is being performed in two adjoining, connecting spaces.

(c) Entry procedures. Entry into and work within may proceed if:

- There are no nonatmospheric hazards present;

- The preentry tests show there is no dangerous air contamination and/or oxygen deficiency within the space and there is no reason to believe that any is likely to develop;

- Continuous testing of the atmosphere in the immediate vicinity of the workers within the space is accomplished;

- Workers will immediately leave the sewer when any of the gas monitor alarm set points are reached as defined; and

- Workers will not return to the area until a SUPERVISOR who has completed the gas detector training has used a direct reading gas detector to evaluate the situation and has determined that it is safe to enter.

(d) Rescue. Arrangements for rescue services are not required for entries that do not require a permit. See the rescue portion of subsection (3), below, for instructions regarding rescue planning where an entry permit is required.

(3) Entry permit required.

(a) Entry permits.

- All sewers are considered permit-required confined spaces until the preentry procedures demonstrate otherwise.

- Any employee required or permitted to precheck or enter a sewer must have successfully completed, as a minimum, the training as required by the following sections of these procedures.

- A written copy of operating and rescue procedures as required by these procedures must be at the worksite for the duration of the job.

- The sewer entry permit must be completed before approval can be given to enter a sewer.

- The permit verifies completion of items listed below.

- The permit must be kept at the job site for the duration of the job.

- If circumstances cause an interruption in the work or a change in the alarm conditions for which entry was approved, a new sewer entry permit must be completed.

(b) Control of atmospheric and engulfment hazards.

(i) Surveillance. The surrounding area must be surveyed to avoid hazards such as drifting vapors from tanks, piping or sewers.

(ii) Testing.

- The sewer atmosphere must be tested to determine whether dangerous air contamination and/or oxygen deficiency exists.

- A direct reading gas monitor must be used.

- Testing must be performed by a SUPERVISOR who has successfully completed the gas detector training for the monitoring method used.

- The minimum parameters to be monitored are oxygen deficiency, LFL and hydrogen sulfide concentration.

- A written record of the preentry test results must be made and kept at the worksite for the duration of the job.

- Affected employees must be able to review the testing results.

- The most hazardous conditions will govern when work is being performed in two adjoining, connected spaces.

(iii) Space ventilation.

- Mechanical ventilation systems, where applicable, must be set at one hundred percent outside air.

- Where possible, open additional manholes to increase air circulation.

- Use portable blowers to augment natural circulation if needed.

- After a suitable ventilating period, repeat the testing.

- Entry may not begin until testing has demonstrated that the hazardous atmosphere has been eliminated or controlled.

(c) Entry procedures. Under any of the following conditions:

- Testing demonstrates the existence of dangerous or deficient conditions and additional ventilation cannot reduce concentrations to safe levels;

- The atmosphere tests as safe but unsafe conditions can reasonably be expected to develop;

- It is not feasible to provide for ready exit from spaces equipped with automatic fire suppression systems and it is not practical or safe to deactivate such systems; or

- An emergency exists and it is not feasible to wait for preentry procedures to take effect.

The following procedures must be observed:

- All personnel must be trained.

- A self-contained breathing apparatus must be worn by any person entering the sewer.

- At least one worker must stand by the outside of the sewer ready to give assistance in case of emergency.

- The rescue workers must have a self-contained breathing apparatus available for immediate use.

- There must be at least one additional worker within sight or call of the standby worker.

- Continuous powered communications must be maintained between the worker within the sewer and standby personnel.

- If at any time there is any questionable action or non-movement by the worker inside, a verbal check will be made. If there is no response or a questionable response, the worker will be removed immediately from the sewer.

Exception: If the worker is disabled due to falling or impact, the worker must not be removed from the sewer unless there is immediate danger to the worker's life. Local rescue personnel must be notified immediately. The standby worker may not enter the sewer in this case, only trained rescue personnel (wearing self contained breathing apparatus) may enter to perform a rescue. A full-body harness with attached lifeline must be used by all workers entering the space with the free end of the line secured outside the entry opening. The standby worker must use the lifeline to attempt to rescue a disabled worker without entering the space and summon rescue services based on their assessment of the situation.

- When practical, the full-body harness must suspend a person upright and a hoisting device or similar apparatus must be available for lifting workers out of the sewer.

- In any situation where their use may endanger the worker, use of a hoisting device or full-body harness and attached lifeline may be discontinued.

- When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment must be Class 1, Division 1 rated per National Electrical Code and no ignition sources may be introduced into the area.

- Continuous gas monitoring must be performed during all sewer entry operations. If alarm conditions occur, entry personnel must exit the sewer and a new sewer entry permit issued.

- Rescue. Call the local rescue services for rescue. Where immediate hazards to injured personnel are present, workers at the site must implement emergency procedures without entering the sewer. Rescue entries into sewers must be made only by trained and properly equipped personnel.

Example 2. Workplace. Meat and poultry rendering plants.

Cookers and dryers are either batch or continuous in their operation. Multiple batch cookers are operated in parallel. When one unit of a multiple set is shut down for repairs, means are available to isolate that unit from the others which remain in operation.

Cookers and dryers are horizontal, cylindrical vessels equipped with a center, rotating shaft and agitator paddles or discs. If the inner shell is jacketed, it is usually heated with steam at pressures up to 150 psig (1034.25 kPa). The rotating shaft assembly of the continuous cooker or dryer is also steam heated.

(1) Potential hazards. The recognized hazards associated with cookers and dryers are the risk that employees could be:

- (a) Struck or caught by rotating agitator;
- (b) Engulfed in raw material or hot, recycled fat;
- (c) Burned by steam from leaks into the cooker/dryer steam jacket or the condenser duct system if steam valves are not properly closed and locked out;
- (d) Burned by contact with hot metal surfaces, such as the agitator shaft assembly, or inner shell of the cooker/dryer;
- (e) Heat stress caused by warm atmosphere inside cooker/dryer;
- (f) Slipping and falling on grease in the cooker/dryer;
- (g) Electrically shocked by faulty equipment taken into the cooker/dryer;
- (h) Burned or overcome by fire or products of combustion; or
- (i) Overcome by fumes generated by welding or cutting done on grease covered surfaces.

(2) Permits.

- The supervisor in this case is always present at the cooker/dryer or other permit entry confined space when entry is made.

- The supervisor must follow the preentry isolation procedures described in the entry permit in preparing for entry, and ensure that the protective clothing, ventilating equipment and any other equipment required by the permit are at the entry site.

(3) Control of hazards. Mechanical.

- Lock out main power switch to agitator motor at main power panel.

- Affix tag to the lock to inform others that a permit entry confined space entry is in progress.

(4) Engulfment.

- Close all valves in the raw material blow line.

- Secure each valve in its closed position using chain and lock.

- Attach a tag to the valve and chain warning that a permit entry confined space entry is in progress.

- The same procedure must be used for securing the fat recycle valve.

(5) Burns and heat stress.

- Close steam supply valves to jacket and secure with chains and tags.

- Insert solid blank at flange in cooker vent line to condenser manifold duct system.

- Vent cooker/dryer by opening access door at discharge end and top center door to allow natural ventilation throughout the entry.

- If faster cooling is needed, use a portable ventilation fan to increase ventilation.

- Cooling water may be circulated through the jacket to reduce both outer and inner surface temperatures of cooker/dryers faster.

- Check air and inner surface temperatures in cooker/dryer to assure they are within acceptable limits before entering, or use proper protective clothing.

(6) Fire and fume hazards.

- Careful site preparation, such as cleaning the area within four inches (10.16 cm) of all welding or torch cutting operations, and proper ventilation are the preferred controls.

- All welding and cutting operations must be done in accordance with the requirements of chapter 296-24 WAC, Part I, Welding, cutting, and brazing.

- Proper ventilation may be achieved by local exhaust ventilation, or the use of portable ventilation fans, or a combination of the two practices.

(7) Electrical shock. Electrical equipment used in cooker/dryers must be in serviceable condition.

(8) Slips and falls. Remove residual grease before entering cooker/dryer.

(9) Attendant. The supervisor must be the attendant for employees entering cooker/dryers.

(10) Permit. The permit must specify how isolation must be done and any other preparations needed before making entry. This is especially important in parallel arrangements of cooker/dryers so that the entire operation need not be shut down to allow safe entry into one unit.

(11) Rescue. When necessary, the attendant must call the employer's trained rescue team or the local fire services as previously arranged.

Example 3. Workplace. Workplaces where tank cars, trucks, and trailers, dry-bulk tanks and trailers, railroad tank cars, and similar portable tanks are fabricated or serviced.

(1) During fabrication. These tanks and dry-bulk carriers are entered repeatedly throughout the fabrication process. These products are not configured identically, but the manufacturing processes by which they are made are very similar.

(a) Sources of hazards. In addition to the mechanical hazards arising from the risks that an entrant would be injured due to contact with components of the tank or the tools being used, there is also the risk that a worker could be injured by breathing fumes from welding materials or mists or vapors from materials used to coat the tank interior. In addition, many of these vapors and mists are flammable, so the failure to properly ventilate a tank could lead to a fire or explosion.

(b) Control of hazards.

(i) Welding. Local exhaust ventilation must be used to remove welding fumes once the tank or carrier is completed to the point that workers may enter and exit only through a manhole. (Follow the requirements of chapter 296-24 WAC, Part I, Welding, cutting and brazing, at all times.) Welding gas tanks may never be brought into a tank or carrier that is a permit entry confined space.

(ii) Application of interior coatings/linings.

- Atmospheric hazards must be controlled by forced air ventilation sufficient to keep the atmospheric concentration of flammable materials below ten percent of the lower flammable limit (LFL) (or lower explosive limit (LEL), whichever term is used locally).

- The appropriate respirators are provided and shall be used in addition to providing forced ventilation if the forced ventilation does not maintain acceptable respiratory conditions.

(c) Permits. Because of the repetitive nature of the entries in these operations, an "area entry permit" will be issued for a one-month period to cover those production areas where tanks are fabricated to the point that entry and exit are made using manholes.

(d) Authorization. Only the area supervisor may authorize an employee to enter a tank within the permit area. The area supervisor must determine that conditions in the tank trailer, dry-bulk trailer or truck, etc., meet permit requirements before authorizing entry.

(e) Attendant.

- The area supervisor must designate an employee to maintain communication by employer specified means with employees working in tanks to ensure their safety.

- The attendant may not enter any permit entry confined space to rescue an entrant or for any other reason, unless authorized by the rescue procedure and, and even then, only after calling the rescue team and being relieved by an attendant by another worker.

(f) Communications and observation.

- Communications between attendant and entrant(s) must be maintained throughout entry.

- Methods of communication that may be specified by the permit include voice, voice-powered radio, tapping or rapping codes on tank walls, signaling tugs on a rope, and the attendant's observation that work activities such as chipping, grinding, welding, spraying, etc., which require deliberate operator control continue normally.

- These activities often generate so much noise that the necessary hearing protection makes communication by voice difficult.

(g) Rescue procedures.

- Acceptable rescue procedures include entry by a team of employee-rescuers, use of public emergency services, and procedures for breaching the tank.

- The area permit specifies which procedures are available, but the area supervisor makes the final decision based on circumstances. (Certain injuries may make it necessary to breach the tank to remove a person rather than risk additional injury by removal through an existing manhole.

- However, the supervisor must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For instance, if the tank must be breached by cutting with a torch, the tank surfaces to be cut must be free of volatile or combustible coatings within four inches (10.16 cm) of the cutting line and the atmosphere within the tank must be below the LFL.)

(h) Retrieval line and harnesses.

- The retrieval lines and harnesses generally required under this standard are usually impractical for use in tanks because the internal configuration of the tanks and their interior baffles and other structures would prevent rescuers from hauling out injured entrants.

- However, unless the rescue procedure calls for breaching the tank for rescue, the rescue team must be trained in the use of retrieval lines and harnesses for removing injured employees through manholes.

(2) Repair or service of "used" tanks and bulk trailers.

(a) Sources of hazards. In addition to facing the potential hazards encountered in fabrication or manufacturing, tanks or trailers which have been in service may contain residues of dangerous materials, whether left over from the transportation of hazardous cargoes or generated by chemical or bacterial action on residues of nonhazardous cargoes.

(b) Control of atmospheric hazards. A "used" tank must be brought into areas where tank entry is authorized only after the tank has been emptied, cleansed (without employee entry) of any residues, and purged of any potential atmospheric hazards.

(c) Welding. In addition to tank cleaning for control of atmospheric hazards, coating and surface materials must be removed four inches (10.16 cm) or more from any surface area where welding or other torch work will be done and care taken that the atmosphere within the tank remains well below the LFL. (Follow the requirements of chapter 296-24 WAC, Part I, Welding, cutting and brazing, at all times.)

(d) Permits.

- An entry permit valid for up to one year must be issued prior to authorization of entry into used tank trailers, dry-bulk trailers or trucks.

- In addition to the preentry cleaning requirement, this permit must require the employee safeguards specified for new tank fabrication or construction permit areas.

(e) Authorization.

- Only the area supervisor may authorize an employee to enter a tank trailer, dry-bulk trailer or truck within the permit area.

- The area supervisor must determine that the entry permit requirements have been met before authorizing entry.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14173, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14174, Appendix D, Sample A

Confined Space Entry Permit

Date & Time Issued: _____

Date & Time Expires: _____

Job Site/Space I.D.: _____

Job Supervisor: _____

Equipment to be worked on: _____

Work to be performed: _____

Stand-by personnel: _____

1. Atmospheric Checks:

Time	_____		
Oxygen	_____	%	
Explosives	_____	%L.F.L.	
Toxic	_____	PPM	

8. Entry, standby, and back up persons:

	Yes	No
Successfully completed required training?	()	()
Is it current?	()	()

2. Tester's signature _____

9. Equipment:

3. Source isolation (No Entry):

N/A	Yes	No
Pumps or lines blinded, disconnected, or blocked	()	()

N/A	Yes	No
Direct reading gas monitor-tested	()	()
Safety harnesses and lifelines for entry and standby persons	()	()
Hoisting equipment	()	()
Powered communications	()	()
SCBA's for entry and standby persons	()	()
Protective Clothing	()	()
All electric equipment listed Class I, Division I, Group D and Non-sparking tools	()	()

4. Ventilation Modification:

N/A	Yes	No
Mechanical	()	()
Natural Ventilation only	()	()

5. Atmospheric check after isolation and ventilation:

Oxygen	_____	%	>19.5%
Explosive	_____	%L.F.L.	<10%
Toxic	_____	PPM	<10 PPM H ₂ S
Time	_____		
Tester's signature	_____		

6. Communication procedures: _____

10. Periodic atmospheric tests:

Oxygen	_____	%	Time	_____	Oxygen	_____	%	Time	_____
Oxygen	_____	%	Time	_____	Oxygen	_____	%	Time	_____
Explosive	_____	%	Time	_____	Explosive	_____	%	Time	_____
Explosive	_____	%	Time	_____	Explosive	_____	%	Time	_____
Toxic	_____	%	Time	_____	Toxic	_____	%	Time	_____
Toxic	_____	%	Time	_____	Toxic	_____	%	Time	_____

7. Rescue procedures: _____

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit Prepared By: (Supervisor) _____

Approved By: (Unit Supervisor) _____

Reviewed By: (Cs Operations Personnel) _____

(printed name)

(signature)

This permit to be kept at job site. Return job site copy to Safety Office following job completion.

Entrant Name:	Sign In	Sign Out	Sign In	Sign Out
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

WAC 296-62-14174, Appendix D, Sample B

Entry Permit

PERMIT VALID FOR 8 HOURS ONLY. ALL PERMIT COPIES REMAIN AT THE SITE UNTIL JOB COMPLETED.

DATE: - - - SITE LOCATION/DESCRIPTION _____

PURPOSE OF ENTRY _____

SUPERVISOR(S) in charge of crews. _____ Type of Crew _____ Phone # _____

COMMUNICATIONS PROCEDURES _____

RESCUE PROCEDURES (PHONE NUMBER AT BOTTOM) _____

BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
LockOut/De-energize/Try-out	_____	_____	Full Body Harness w/ "D" ring	_____	_____
Line(s) Broken-Capped-Blank	_____	_____	Emergency Escape Retrieval Eq.	_____	_____
Purge-Flush and Vent	_____	_____	Lifelines	_____	_____
Ventilation	_____	_____	Fire Extinguishers	_____	_____
Secure Area (Post and Flag)	_____	_____	Lighting (Explosive Proof)	_____	_____
Breathing Apparatus	_____	_____	Protective Clothing	_____	_____
Resuscitator - Inhalator	_____	_____	Respirator(s) (Air Purifying)	_____	_____
Standby Safety Personnel	_____	_____	Burning and Welding Permit	_____	_____

Note: Items that do not apply enter N/A in the blank.

****RECORD CONTINUOUS MONITORING RESULTS EVERY 2 HOURS****

CONTINUOUS MONITORING**	Permissible Entry Level	_____	_____	_____	_____	_____	_____	_____	_____	_____
TEST(S) TO BE TAKEN	19.5% TO 23.5%	_____	_____	_____	_____	_____	_____	_____	_____	_____
LOWER FLAMMABLE LIMIT	Under 10%	_____	_____	_____	_____	_____	_____	_____	_____	_____
CARBON MONOXIDE	+35 PPM	_____	_____	_____	_____	_____	_____	_____	_____	_____
Aromatic Hydrocarbon	+ 1PPM * 5 PPM	_____	_____	_____	_____	_____	_____	_____	_____	_____
Hydrogen Cyanide	(Skin) * 4 PPM	_____	_____	_____	_____	_____	_____	_____	_____	_____
Hydrogen Sulfide	+10 PPM * 15 PPM	_____	_____	_____	_____	_____	_____	_____	_____	_____
Sulfur Dioxide	+2 PPM *5 PPM	_____	_____	_____	_____	_____	_____	_____	_____	_____
Ammonia	*35 PPM	_____	_____	_____	_____	_____	_____	_____	_____	_____

- * Short-term exposure limit: Employee can work in the area up to 15 minutes.
- * 8 hr. Time Weighted Avg. Employee can work in the area 8 hrs. (longer with appropriate respiratory protection).

REMARKS:

GAS TESTER NAME & CHECK #	INSTRUCTION(S) USED	MODEL &/OR TYPE	SERIAL &/OR UNIT #
_____	_____	_____	_____

SAFETY STANDBY PERSON IS REQUIRED FOR ALL CONFINED SPACE WORK

SAFETY STANDBY PERSON(S)	CHECK#	CONFINED SPACE ENTRANT(S)	CHECK#	CONFINED SPACE ENTRANT(S)	CHECK#
_____	_____	_____	_____	_____	_____

SUPERVISOR AUTHORIZATION - ALL CONDITIONS SATISFIED _____ DEPARTMENT/PHONE# _____
 AMBULANCE# _____ FIRE# _____ SAFETY# _____ GAS COORDINATOR# _____

WAC 296-62-14175 Appendix E—Sewer system entry. Sewer entry differs in three vital respects from other permit entries:

- There rarely exists any way to completely isolate the space (a section of a continuous system) to be entered;
- Because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant or employer; and
- Experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a permit space.

(1) Adherence to procedure. The employer should designate as entrants only employees who are thoroughly trained in the employer's sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries.

(2) Atmospheric monitoring. Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions is encountered:

- Oxygen concentration less than 19.5 percent; flammable gas or vapor at ten percent or more of the lower flammable limit (LFL); or
- Hydrogen sulfide or carbon monoxide at or above 10 ppm or 35 ppm, respectively, measured as an eight-hour time-weighted average.

Atmospheric monitoring equipment needs to be calibrated according to the manufacturer's instructions. The oxygen sensor/broad range sensor is best suited for initial use in situations where the actual or potential contaminants have not been identified, because broad range sensors, unlike substance-specific sensors, enable employers to obtain an overall reading of the hydrocarbons (flammables) present in the space.

However, such sensors only indicate that a hazardous threshold of a class of chemicals has been exceeded. They do not measure the levels of contamination of specific substances. Therefore, substance-specific devices, which measure the actual levels of specific substances, are best suited for use where actual and potential contaminants have been identified.

The measurements obtained with substance-specific devices are of vital importance to the employer when decisions are made concerning the measures necessary to protect entrants (such as ventilation or personal protective equipment) and the setting and attainment of appropriate entry conditions. However, the sewer environment may suddenly and unpredictably change, and the substance-specific devices may not detect the potentially lethal atmospheric hazards which may enter the sewer environment.

(a) Although WISHA considers the information and guidance provided above to be appropriate and useful in most sewer entry situations, the department emphasizes that each employer must consider the unique circumstances, including the predictability of the atmosphere, of the sewer permit spaces in the employer's workplace in preparing for entry.

(2001 Ed.)

Only the employer can decide, based upon his or her knowledge of, and experience with permit spaces in sewer systems, what the best type of testing instrument may be for any specific entry operation.

(b) The selected testing instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric condition. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

(3) Surge flow and flooding. Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

(4) Special equipment. Entry into large bore sewers may require the use of special equipment. Such equipment might include such items as atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least ten minute air supply (or other NIOSH approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14175, filed 10/29/99, effective 2/1/00.]

WAC 296-62-14176 Appendix F—Rescue team or rescue service evaluation criteria. (1) This appendix provides guidance to employers in choosing an appropriate rescue service. It contains criteria that may be used to evaluate the capabilities both of prospective and current rescue teams. Before a rescue team can be trained or chosen, however, a satisfactory permit program, including an analysis of all permit-required confined spaces to identify all potential hazards in those spaces, must be completed. WISHA believes that compliance with all the provisions of chapter 296-62 WAC, Part M will enable employers to conduct permit space operations without recourse to rescue services in nearly all cases. However, experience indicates that circumstances will arise where entrants will need to be rescued from permit spaces. It is therefore important for employers to select rescue services or teams, either on-site or off-site, that are equipped and capable of minimizing harm to both entrants and rescuers if the need arises.

(2) For all rescue teams or services, the employer's evaluation should consist of two components:

- An initial evaluation, in which employers decide whether a potential rescue service or team is adequately trained and equipped to perform permit space rescues of the kind needed at the facility and whether such rescuers can respond in a timely manner; and
- A performance evaluation, in which employers measure the performance of the team or service during an actual or practice rescue.

[Title 296 WAC—p. 1781]

For example, based on the initial evaluation, an employer may determine that maintaining an on-site rescue team will be more expensive than obtaining the services of an off-site team, without being significantly more effective, and decide to hire a rescue service. During a performance evaluation, the employer could decide, after observing the rescue service perform a practice rescue, that the service's training or preparedness was not adequate to effect a timely or effective rescue at his or her facility and decide to select another rescue service, or to form an internal rescue team.

(a) Initial evaluation.

(i) The employer should meet with the prospective rescue service to facilitate the evaluations required by WAC 296-62-14150 (1)(a) and (b).

- At a minimum, if an off-site rescue service is being considered, the employer must contact the service to plan and coordinate the evaluations required by the standard.

- Merely posting the service's number or planning to rely on the 911 emergency phone number to obtain these services at the time of a permit space emergency would not comply with WAC 296-62-14150(1).

(ii) The capabilities required of a rescue service vary with the type of permit spaces from which rescue may be necessary and the hazards likely to be encountered in those spaces. Answering the questions below will assist employers in determining whether the rescue service is capable of performing rescues in the permit spaces present at the employer's workplace.

(A) What are the needs of the employer with regard to response time (time for the rescue service to receive notification, arrive at the scene, and set up and be ready for entry)?

For example, if entry is to be made into an IDLH atmosphere, or into a space that can quickly develop an IDLH atmosphere (if ventilation fails or for other reasons), the rescue team or service would need to be standing by at the permit space. On the other hand, if the danger to entrants is restricted to mechanical hazards that would cause injuries (e.g., broken bones, abrasions) a response time of ten or fifteen minutes might be adequate.

(B) How quickly can the rescue team or service get from its location to the permit spaces from which rescue may be necessary?

Relevant factors to consider would include:

- The location of the rescue team or service relative to the employer's workplace;
- The quality of roads and highways to be traveled, potential bottlenecks or traffic congestion that might be encountered in transit;

- The reliability of the rescuer's vehicles; and

- The training and skill of its drivers.

(C) What is the availability of the rescue service?

- Is it unavailable at certain times of the day or in certain situations?

- What is the likelihood that key personnel of the rescue service might be unavailable at times?

- If the rescue service becomes unavailable while an entry is underway, does it have the capability of notifying the employer so that the employer can instruct the attendant to abort the entry immediately?

(D) Does the rescue service meet all the requirements of WAC 296-62-14150(2) of the standard?

- If not, has it developed a plan that will enable it to meet those requirements in the future?

- If so, how soon can the plan be implemented?

(E) For off-site services, is the service willing to perform rescues at the employer's workplace? (An employer may not rely on a rescuer who declines, for whatever reason, to provide rescue services.)

(F) Is an adequate method for communications between the attendant, employer and prospective rescuer available so that a rescue request can be transmitted to the rescuer without delay? How soon after notification can a prospective rescuer dispatch a rescue team to the entry site?

(G) For rescues into spaces that may pose significant atmospheric hazards and from which rescue entry, patient packaging and retrieval cannot be safely accomplished in a relatively short time (fifteen to twenty minutes), employers should consider using airline respirators (with escape bottles) for the rescuers and to supply rescue air to the patient. If the employer decides to use SCBA, does the prospective rescue service have an ample supply of replacement cylinders and procedures for rescuers to enter and exit (or be retrieved) well within the SCBA's air supply limits?

(H) If the space has a vertical entry over five feet in depth, can the prospective rescue service properly perform entry rescues? Does the service have the technical knowledge and equipment to perform rope work or elevated rescue, if needed?

(I) Does the rescue service have the necessary skills in medical evaluation, patient packaging and emergency response?

(J) Does the rescue service have the necessary equipment to perform rescues, or must the equipment be provided by the employer or another source?

(b) Performance evaluation.

Rescue services are required by WAC 296-62-14150 (2)(c) of the standard to practice rescues at least once every twelve months, provided that the team or service has not successfully performed a permit space rescue within that time. As part of each practice session, the service should perform a critique of the practice rescue, or have another qualified party perform the critique, so that deficiencies in procedures, equipment, training, or number of personnel can be identified and corrected. The results of the critique, and the corrections made to respond to the deficiencies identified, should be given to the employer to enable it to determine whether the rescue service can quickly be upgraded to meet the employer's rescue needs or whether another service must be selected. The following questions will assist employers and rescue teams and services evaluate their performance.

(i) Have all members of the service been trained as permit space entrants, at a minimum, including training in the potential hazards of all permit spaces, or of representative permit spaces, from which rescue may be needed? Can team members recognize the signs, symptoms, and consequences of exposure to any hazardous atmospheres that may be present in those permit spaces?

(ii) Is every team member provided with, and properly trained in, the use and need for PPE, such as SCBA or fall

arrest equipment, which may be required to perform permit space rescues in the facility? Is every team member properly trained to perform his or her functions and make rescues, and to use any rescue equipment, such as ropes and backboards, that may be needed in a rescue attempt?

(iii) Are team members trained in the first aid and medical skills needed to treat victims overcome or injured by the types of hazards that may be encountered in the permit spaces at the facility?

(iv) Do all team members perform their functions safely and efficiently? Do rescue service personnel focus on their own safety before considering the safety of the victim?

(v) If necessary, can the rescue service properly test the atmosphere to determine if it is IDLH?

(vi) Can the rescue personnel identify information pertinent to the rescue from entry permits, hot work permits, and MSDSs?

(vii) Has the rescue service been informed of any hazards to personnel that may arise from outside the space, such as those that may be caused by future work near the space?

(viii) If necessary, can the rescue service properly package and retrieve victims from a permit space that has a limited size opening (less than twenty-four inches (60.9 cm) in diameter), limited internal space, or internal obstacles or hazards?

(ix) If necessary, can the rescue service safely perform an elevated (high angle) rescue?

(x) Does the rescue service have a plan for each of the kinds of permit space rescue operations at the facility? Is the plan adequate for all types of rescue operations that may be needed at the facility? Teams may practice in representative spaces, or in spaces that are "worst-case" or most restrictive with respect to internal configuration, elevation, and portal size. The following characteristics of a practice space should be considered when deciding whether a space is truly representative of an actual permit space:

(A) Internal configuration.

(I) Open — There are no obstacles, barriers, or obstructions within the space. One example is a water tank.

(II) Obstructed — The permit space contains some type of obstruction that a rescuer would need to maneuver around. An example would be a baffle or mixing blade. Large equipment, such as a ladder or scaffold, brought into a space for work purposes would be considered an obstruction if the positioning or size of the equipment would make rescue more difficult.

(B) Elevation.

(I) Elevated — A permit space where the entrance portal or opening is above grade by four feet or more. This type of space usually requires knowledge of high angle rescue procedures because of the difficulty in packaging and transporting a patient to the ground from the portal.

(II) Nonelevated — A permit space with the entrance portal located less than four feet above grade. This type of space will allow the rescue team to transport an injured employee normally.

(C) Portal size.

(I) Restricted — A portal of twenty-four inches or less in the least dimension. Portals of this size are too small to allow a rescuer to simply enter the space while using SCBA. The

portal size is also too small to allow normal spinal immobilization of an injured employee.

(II) Unrestricted — A portal of greater than twenty-four inches in the least dimension. These portals allow relatively free movement into and out of the permit space.

(D) Space access.

(I) Horizontal — The portal is located on the side of the permit space. Use of retrieval lines could be difficult.

(II) Vertical — The portal is located on the top of the permit space, so that rescuers must climb down, or the bottom of the permit space, so that rescuers must climb up to enter the space. Vertical portals may require knowledge of rope techniques, or special patient packaging to safely retrieve a downed entrant.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-22-046, § 296-62-14176, filed 10/29/99, effective 2/1/00.]

PART N—COTTON DUST

WAC 296-62-14533 Cotton dust. (1) Scope and application.

(a) This section, in its entirety, applies to the control of employee exposure to cotton dust in all workplaces where employees engage in yarn manufacturing, engage in slashing and weaving operations, or work in waste houses for textile operations.

(b) This section does not apply to the handling or processing of woven or knitted materials; to maritime operations covered by chapters 296-56 and 296-304 WAC; to harvesting or ginning of cotton; or to the construction industry.

(c) Only subsection (8) Medical surveillance, subsection (11) (b) Medical surveillance, subsection (11)(c) Availability, subsection (11)(d) Transfer of records, and Appendices B, C, and D of this section apply in all work places where employees exposed to cotton dust engage in cottonseed processing or waste processing operations.

(d) This section applies to yarn manufacturing and slashing and weaving operations exclusively using washed cotton (as defined by subsection (14) of this section) only to the extent specified by subsection (14) of this section.

(e) This section, in its entirety, applies to the control of all employees exposure to the cotton dust generated in the preparation of washed cotton from opening until the cotton is thoroughly wetted.

(f) This section does not apply to knitting, classing or warehousing operations except that employers with these operations, if requested by WISHA, shall grant WISHA access to their employees and workplaces for exposure monitoring and medical examinations for purposes of a health study to be performed by WISHA on a sampling basis.

(2) Definitions applicable to this section:

(a) "Blow down" - the cleaning of equipment and surfaces with compressed air.

(b) "Blow off" - the use of compressed air for cleaning of short duration and usually for a specific machine or any portion of a machine.

(c) "Cotton dust" - dust present in the air during the handling or processing of cotton, which may contain a mixture of many substances including ground-up plant matter, fiber, bacteria, fungi, soil, pesticides, noncotton plant matter and

other contaminants which may have accumulated with the cotton during the growing, harvesting and subsequent processing or storage periods. Any dust present during the handling and processing of cotton through the weaving or knitting of fabrics, and dust present in other operations or manufacturing processes using raw or waste cotton fibers or cotton fiber byproducts from textile mills are considered cotton dust within this definition. Lubricating oil mist associated with weaving operations is not considered cotton dust.

(d) "Director" - the director of labor and industries or his authorized representative.

(e) "Equivalent instrument" - a cotton dust sampling device that meets the vertical elutriator equivalency requirements as described in subsection (4)(a)(iii) of this section.

(f) "Lint-free respirable cotton dust" - particles of cotton dust of approximately 15 microns or less aerodynamic equivalent diameter.

(g) "Vertical elutriator cotton dust sampler" or "vertical elutriator" - a dust sampler which has a particle size cut-off at approximately 15 microns aerodynamic equivalent diameter when operating at the flow rate of 7.4 ± 0.2 liters per minute.

(h) "Waste processing" - waste recycling (sorting, blending, cleaning and willowing) and garnetting.

(i) "Yarn manufacturing" - all textile mill operations from opening to, but not including, slashing and weaving.

(3) Permissible exposure limits and action levels.

(a) Permissible exposure limits (PEL).

(i) The employer shall assure that no employee who is exposed to cotton dust in yarn manufacturing and cotton washing operations is exposed to airborne concentrations of lint-free respirable cotton dust greater than $200 \mu\text{g}/\text{m}^3$ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(ii) The employer shall assure that no employee who is exposed to cotton dust in textile mill waste house operations or is exposed in yarn manufacturing to dust from "lower grade washed cotton" as defined in subsection (14)(e) of this section is exposed to airborne concentrations of lint-free respirable cotton dust greater than $500 \mu\text{g}/\text{m}^3$ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(iii) The employer shall assure that no employee who is exposed to cotton dust in the textile processes known as slashing and weaving is exposed to airborne concentrations of lint-free respirable cotton dust greater than $750 \mu\text{g}/\text{m}^3$ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(b) Action levels.

(i) The action level for yarn manufacturing and cotton washing operations is an airborne concentration of lint-free respirable cotton dust of $100 \mu\text{g}/\text{m}^3$ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(ii) The action level for waste houses for textile operations is an airborne concentration of lint-free respirable cotton dust of $250 \mu\text{g}/\text{m}^3$ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(iii) The action level for the textile processes known as slashing and weaving is an airborne concentration of lint-free respirable cotton dust of $375 \mu\text{g}/\text{m}^3$ mean concentration, averaged over an eight-hour period, as measured by a vertical elutriator or an equivalent instrument.

(4) Exposure monitoring and measurement.

(a) General.

(i) For the purposes of this section, employee exposure is that exposure which would occur if the employee were not using a respirator.

(ii) The sampling device to be used shall be either the vertical elutriator cotton dust sampler or an equivalent instrument.

(iii) If an alternative to the vertical elutriator cotton dust sampler is used, the employer shall establish equivalency by demonstrating that the alternative sampling devices:

(A) It collects respirable particulates in the same range as the vertical elutriator (approximately 15 microns);

(B) Replicate exposure data used to establish equivalency are collected in side-by-side field and laboratory comparisons; and

(C) A minimum of 100 samples over the range of 0.5 to 2 times the permissible exposure limit are collected, and ninety percent of these samples have an accuracy range of plus or minus twenty-five percent of the vertical elutriator reading with a ninety-five percent confidence level as demonstrated by a statistically valid protocol. (An acceptable protocol for demonstrating equivalency is described in Appendix E of this section.)

(iv) WISHA will issue a written opinion stating that an instrument is equivalent to a vertical elutriator cotton dust sampler if:

(A) A manufacturer or employer requests an opinion in writing and supplies the following information:

(I) Sufficient test data to demonstrate that the instrument meets the requirements specified in this paragraph and the protocol specified in Appendix E of this section;

(II) Any other relevant information about the instrument and its testing requested by WISHA; and

(III) A certification by the manufacturer or employer that the information supplied is accurate, and

(B) If WISHA finds, based on information submitted about the instrument, that the instrument meets the requirements for equivalency specified by this subsection.

(b) Initial monitoring. Each employer who has a place of employment within the scope of subsections (1)(a), (d) or (e) of this section shall conduct monitoring by obtaining measurements which are representative of the exposure of all employees to airborne concentrations of lint-free respirable cotton dust over an eight-hour period. The sampling program shall include at least one determination during each shift for each work area.

(c) Periodic monitoring.

(i) If the initial monitoring required by (4)(b) of this section or any subsequent monitoring reveals employee exposure to be at or below the permissible exposure limit, the employer shall repeat the monitoring for those employees at least annually.

(ii) If the initial monitoring required by (4)(b) of this section or any subsequent monitoring reveals employee expo-

sure to be above the PEL, the employer shall repeat the monitoring for those employees at least every six months.

(iii) Whenever there has been a production, process, or control change which may result in new or additional exposure to cotton dust, or whenever the employer has any other reason to suspect an increase in employee exposure, the employer shall repeat the monitoring and measurements for those employees affected by the change or increase.

(d) Employee notification.

(i) Within twenty working days after the receipt of monitoring results, the employer shall notify each employee in writing of the exposure measurements which represent that employee's exposure.

(ii) Whenever the results indicate that the employee's exposure exceeds the applicable permissible exposure limit specified in subsection (3) of this section, the employer shall include in the written notice a statement that the permissible exposure limit was exceeded and a description of the corrective action taken to reduce exposure below the permissible exposure limit.

(5) Methods of compliance.

(a) Engineering and work practice controls. The employer shall institute engineering and work practice controls to reduce and maintain employee exposure to cotton dust at or below the permissible exposure limit specified in subsection (3) of this section, except to the extent that the employer can establish that such controls are not feasible.

(b) Whenever feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the permissible exposure limit, the employer shall nonetheless institute these controls to immediately reduce exposure to the lowest feasible level, and shall supplement these controls with the use of respirators which shall comply with the provisions of subsection (6) of this section.

(c) Compliance program.

(i) Where the most recent exposure monitoring data indicates that any employee is exposed to cotton dust levels greater than the permissible exposure limit, the employer shall establish and implement a written program sufficient to reduce exposures to or below the permissible exposure limit solely by means of engineering controls and work practices as required by (a) of this subsection.

(ii) The written program shall include at least the following:

(A) A description of each operation or process resulting in employee exposure to cotton dust;

(B) Engineering plans and other studies used to determine the controls for each process;

(C) A report of the technology considered in meeting the permissible exposure limit;

(D) Monitoring data obtained in accordance with subsection (4) of this section;

(E) A detailed schedule for development and implementation of engineering and work practice controls, including exposure levels projected to be achieved by such controls;

(F) Work practice program; and

(G) Other relevant information.

(iii) The employer's schedule as set forth in the compliance program, shall project completion of the implementation of the compliance program no later than March 27, 1984

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or as soon as possible if monitoring after March 27, 1984 reveals exposures over the PEL, except as provided in (13)(b)(ii)(B) of this section.

(iv) The employer shall complete the steps set forth in his program by the dates in the schedule.

(v) Written programs shall be submitted, upon request, to the director, and shall be available at the worksite for examination and copying by the director, and any affected employee or their designated representatives.

(vi) The written programs required under subsection (5)(c) of this section shall be revised and updated at least every six months to reflect the current status of the program and current exposure levels.

(d) Mechanical ventilation. When mechanical ventilation is used to control exposure, measurements which demonstrate the effectiveness of the system to control exposure, such as capture velocity, duct velocity, or static pressure shall be made at reasonable intervals.

(6) Use of respirators.

(a) General. For employees who are required to use respirators by this section, the employer must provide respirators that comply with the requirements of this section. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering controls and work-practice controls;

(ii) Maintenance and repair activities for which engineering and work-practice controls are not feasible;

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limits;

(iv) Work operations specified under subsection (7)(a) of this section;

(v) Periods for which an employee requests a respirator.

(b) Respirator program.

(i) The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

(ii) Whenever a physician determines that an employee who works in an area in which the cotton-dust concentration exceeds the PEL is unable to use a respirator, including a powered air-purifying respirator, the employee must be given the opportunity to transfer to an available position, or to a position that becomes available later, that has a cotton-dust concentration at or below the PEL. The employer must ensure that such employees retain their current wage rate or other benefits as a result of the transfer.

(c) Respirator selection.

(i) The employer must select the appropriate respirator from Table 1 of this section.

TABLE - 1

Cotton dust concentration	Required respirator
Not greater than—	
(a) 5 x the applicable permissible exposure limit (PEL).	A disposable respirator with a particulate filter.
(b) 10 x the applicable PEL.	A quarter or half-mask respirator, other than a disposable respirator, equipped with particulate filters.

TABLE - 1

Cotton dust concentration	Required respirator
(c) 100 x the applicable PEL.	A full facepiece respirator equipped with high-efficiency particulate filters.
(d) Greater than 100 x the applicable PEL.	A powered air-purifying respirator equipped with high-efficiency particulate filters.

- Notes
1. A disposable respirator means the filter element is an inseparable part of the respirator.
 2. Any respirators permitted at higher environmental concentrations can be used at lower concentrations.
 3. Self-contained breathing apparatus are not required respirators but are permitted respirators.
 4. Supplied air respirators are not required but are permitted under the following conditions: Cotton dust concentration not greater than 10X the PEL—Any supplied air respirator; not greater than 100X the PEL—Any supplied air respirator with full facepiece, helmet or hood; greater than 100X the PEL—A supplied air respirator operated in positive pressure mode.

(ii) Whenever respirators are required by this section for cotton-dust concentrations that do not exceed the applicable permissible exposure limit by a multiple of 100 (100 x), the employer must, when requested by an employee, provide a powered air-purifying respirator with a high-efficiency particulate filter instead of the respirator specified in (a), (b), or (c) of Table 1 of this section.

(7) Work practices. Each employer shall, regardless of the level of employee exposure, immediately establish and implement a written program of work practices which shall minimize cotton dust exposure. The following shall be included where applicable:

(a) Compressed air "blow down" cleaning shall be prohibited, where alternative means are feasible. Where compressed air is used for cleaning, the employees performing the "blow down" or "blow off" shall wear suitable respirators. Employees whose presence is not required to perform "blow down" or "blow off" shall be required to leave the area affected by the "blow down" or "blow off" during this cleaning operation.

(b) Cleaning of clothing or floors with compressed air shall be prohibited.

(c) Floor sweeping shall be performed with a vacuum or with methods designed to minimize dispersal of dust.

(d) In areas where employees are exposed to concentrations of cotton dust greater than the permissible exposure limit, cotton and cotton waste shall be stacked, sorted, baled, dumped, removed or otherwise handled by mechanical means, except where the employer can show that it is infeasible to do so. Where infeasible, the method used for handling cotton and cotton waste shall be the method which reduces exposure to the lowest level feasible.

(8) Medical surveillance.

(a) General.

(i) Each employer covered by the standard shall institute a program of medical surveillance for all employees exposed to cotton dust.

(ii) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided without cost to the employee.

(iii) Persons other than licensed physicians, who administer the pulmonary function testing required by this section

shall have completed a NIOSH approved training course in spirometry.

(b) Initial examinations. The employer shall provide medical surveillance to each employee who is or may be exposed to cotton dust. For new employees' this examination shall be provided prior to initial assignment. The medical surveillance shall include at least the following:

(i) A medical history;

(ii) The standardized questionnaire contained in WAC 296-62-14537; and

(iii) A pulmonary function measurement, including a determination of forced vital capacity (FVC) and forced expiratory volume in one second (FEV₁), the FEV₁/FVC ratio, and the percentage that the measured values of FEV₁ and FVC differ from the predicted values, using the standard tables in WAC 296-62-14539. These determinations shall be made for each employee before the employee enters the workplace on the first day of the work week, preceded by at least thirty-five hours of no exposure to cotton dust. The tests shall be repeated during the shift, no less than four hours and no more than ten hours after the beginning of the work shift; and, in any event, no more than one hour after cessation of exposure. Such exposure shall be typical of the employee's usual workplace exposure. The predicted FEV₁ and FVC for blacks shall be multiplied by 0.85 to adjust for ethnic differences.

(iv) Based upon the questionnaire results, each employee shall be graded according to Schilling's byssinosis classification system.

(c) Periodic examinations.

(i) The employer shall provide at least annual medical surveillance for all employees exposed to cotton dust above the action level in yarn manufacturing, slashing and weaving, cotton washing and waste house operations. The employer shall provide medical surveillance at least every two years for all employees exposed to cotton dust at or below the action level, for all employees exposed to cotton dust from washed cotton (except from washed cotton defined in subsection (9)(c) of this section), and for all employees exposed to cotton dust in cottonseed processing and waste processing operations. Periodic medical surveillance shall include at least an update of the medical history, standardized questionnaire (Appendix B-111), Schilling byssinosis grade, and the pulmonary function measurements in (b)(iii) of this subsection.

(ii) Medical surveillance as required in (c)(i) of this subsection shall be provided every six months for all employees in the following categories:

(A) An FEV₁ of greater than eighty percent of the predicted value, but with an FEV₁ decrement of five percent or 200 ml. on a first working day;

(B) An FEV₁ of less than eighty percent of the predicted value; or

(C) Where, in the opinion of the physician, any significant change in questionnaire findings, pulmonary function results, or other diagnostic tests have occurred.

(iii) An employee whose FEV₁ is less than sixty percent of the predicted value shall be referred to a physician for a detailed pulmonary examination.

(iv) A comparison shall be made between the current examination results and those of previous examinations and a

determination made by the physician as to whether there has been a significant change.

(d) Information provided to the physician. The employer shall provide the following information to the examining physician:

- (i) A copy of this regulation and its appendices;
- (ii) A description of the affected employee's duties as they relate to the employee's exposure;
- (iii) The employee's exposure level or anticipated exposure level;
- (iv) A description of any personal protective equipment used or to be used; and
- (v) Information from previous medical examinations of the affected employee which is not readily available to the examining physician.

(e) Physician's written opinion.

(i) The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

(A) The results of the medical examination and tests including the FEV₁, FVC, and FEV₁/FVC ratio;

(B) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from exposure to cotton dust;

(C) The physician's recommended limitations upon the employee's exposure to cotton dust or upon the employee's use of respirators including a determination of whether an employee can wear a negative pressure respirator, and where the employee cannot, a determination of the employee's ability to wear a powered air purifying respirator; and

(D) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(ii) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure.

(9) Employee education and training.

(a) Training program.

(i) The employer shall provide a training program for all employees exposed to cotton dust and shall assure that each employee is informed of the following:

(A) The acute and long term health hazards associated with exposure to cotton dust;

(B) The names and descriptions of jobs and processes which could result in exposure to cotton dust at or above the PEL.

(C) The measures, including work practices required by subsection (7) of this section, necessary to protect the employee from exposures in excess of the permissible exposure limit;

(D) The purpose, proper use, limitations, and other training requirements for respiratory protection as required by subsection (6) of this section and chapter 296-62 WAC, Part E (see WAC 296-62-07117, 296-62-07172, and 296-62-01786 through 296-62-07190);

(E) The purpose for and a description of the medical surveillance program required by subsection (8) of this section

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and other information which will aid exposed employees in understanding the hazards of cotton dust exposure; and

(F) The contents of this standard and its appendices.

(ii) The training program shall be provided prior to initial assignment and shall be repeated annually for each employee exposed to cotton dust, when job assignments or work processes change and when employee performance indicates a need for retraining.

(b) Access to training materials.

(i) Each employer shall post a copy of this section with its appendices in a public location at the workplace, and shall, upon request, make copies available to employees.

(ii) The employer shall provide all materials relating to the employee training and information program to the director upon request.

(10) Signs. The employer shall post the following warning sign in each work area where the permissible exposure limit for cotton dust is exceeded:

WARNING
COTTON DUST WORK AREA
MAY CAUSE ACUTE OR DELAYED LUNG INJURY
(BYSSINOSIS)
RESPIRATORS REQUIRED IN THIS AREA

(11) Recordkeeping.

(a) Exposure measurements.

(i) The employer shall establish and maintain an accurate record of all measurements required by subsection (4) of this section.

(ii) The record shall include:

(A) A log containing the items listed in WAC 296-62-14533 (4)(a), and the dates, number, duration, and results of each of the samples taken, including a description of the procedure used to determine representative employee exposures;

(B) The type of protective devices worn, if any, and length of time worn; and

(C) The names, social security number, job classifications, and exposure levels of employees whose exposure the measurement is intended to represent.

(iii) The employer shall maintain this record for at least twenty years.

(b) Medical surveillance.

(i) The employer shall establish and maintain an accurate medical record for each employee subject to medical surveillance required by subsection (8) of this section.

(ii) The record shall include:

(A) The name and social security number and description of the duties of the employee;

(B) A copy of the medical examination results including the medical history, questionnaire response, results of all tests, and the physician's recommendation;

(C) A copy of the physician's written opinion;

(D) Any employee medical complaints related to exposure to cotton dust;

(E) A copy of this standard and its appendices, except that the employer may keep one copy of the standard and the appendices for all employees, provided that he references the standard and appendices in the medical surveillance record of each employee; and

(F) A copy of the information provided to the physician as required by subsection (8)(d) of this section.

(iii) The employer shall maintain this record for at least twenty years.

(c) Availability.

(i) The employer shall make all records required to be maintained by subsection (11) of this section available to the director for examination and copying.

(ii) Employee exposure measurement records and employee medical records required by this subsection shall be provided upon request to employees, designated representatives, and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(d) Transfer of records.

(i) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by subsection (11) of this section.

(ii) Whenever the employer ceases to do business, and there is no successor employer to receive and retain the records for the prescribed period, these records shall be transmitted to the director.

(iii) At the expiration of the retention period for the records required to be maintained by this section, the employer shall notify the director at least three months prior to the disposal of such records and shall transmit those records to the director if he requests them within that period.

(iv) The employer shall also comply with any additional requirements involving transfer of records set forth in WAC 296-62-05215.

(12) Observation of monitoring.

(a) The employer shall provide affected employees or their designated representatives an opportunity to observe any measuring or monitoring of employee exposure to cotton dust conducted pursuant to subsection (4) of this section.

(b) Whenever observation of the measuring or monitoring of employee exposure to cotton dust requires entry into an area where the use of personal protective equipment is required, the employer shall provide the observer with and assure the use of such equipment and shall require the observer to comply with all other applicable safety and health procedures.

(c) Without interfering with the measurement, observers shall be entitled to:

(i) An explanation of the measurement procedures;

(ii) An opportunity to observe all steps related to the measurement of airborne concentrations of cotton dust performed at the place of exposure; and

(iii) An opportunity to record the results obtained.

(13) Washed cotton.

(a) Exemptions. Cotton, after it has been washed by the processes described in this section is exempt from all or parts of this section as specified if the requirements of this section are met.

(b) Initial requirements.

(i) In order for an employer to qualify as exempt or partially exempt from this standard for operations using washed cotton, the employer must demonstrate that the cotton was washed in a facility which is open to inspection by the director and the employer must provide sufficient accurate docu-

mentary evidence to demonstrate that the washing methods utilized meet the requirements of this section.

(ii) An employer who handles or processes cotton which has been washed in a facility not under the employer's control and claims an exemption or partial exemption under this paragraph, must obtain from the cotton washer and make available at the worksite, to the director, or his designated representative, to any affected employee, or to their designated representative the following:

(A) A certification by the washer of the cotton of the grade of cotton, the type of washing process, and that the batch meets the requirements of this section:

(B) Sufficient accurate documentation by the washer of the cotton grades and washing process; and

(C) An authorization by the washer that the director may inspect the washer's washing facilities and documentation of the process.

(c) Medical and dyed cotton. Medical grade (USP) cotton, cotton that has been scoured, bleached and dyed, and mercerized yarn shall be exempt from all provisions of this standard.

(d) Higher grade washed cotton. The handling or processing of cotton classed as "low middling light spotted or better" which has been washed:

(i) On a continuous batt system or a rayon rinse system.

(ii) With water,

(iii) At a temperature of no less than 60°C,

(iv) With a water-to-fiber ratio of no less than 40:1, and

(v) With bacterial levels in the wash water controlled to limit bacterial contamination of the cotton, shall be exempt from all provisions of the standard except the requirements of subsection (8) Medical surveillance, subsection (11)(b) Medical surveillance, subsection (11)(c) Availability, subsection (11)(d) Transfer of records, and Appendices B, C, and D of this section.

(e) Lower grade washed cotton. The handling and processing of cotton of grades lower than "low middling light spotted," that has been washed as specified in (d) of this subsection and has also been bleached, shall be exempt from all provisions of the standard except the requirements of subsection (3)(a) Permissible exposure limits, subsection (4) Exposure monitoring and measurement, subsection (8) Medical surveillance, subsection (11) Recordkeeping, and Appendices B, C and D of this section.

(f) Mixed grades of washed cotton. If more than one grade of washed cotton is being handled or processed together, the requirements of the grade with the most stringent exposure limit, medical and monitoring requirements shall be followed.

(14) Appendices.

(a) Appendix B (B-I, B-II and B-III), WAC 296-62-14537, Appendix C, WAC 296-62-14539 and Appendix D, WAC 296-62-14541 are incorporated as part of this chapter and the contents of these appendices are mandatory.

(b) Appendix A of this chapter, WAC 296-62-14535 contains information which is not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

(c) Appendix E of this chapter is a protocol which may be followed in the validation of alternative measuring devices

as equivalent to the vertical elutriator cotton dust sampler. Other protocols may be used if it is demonstrated that they are statistically valid, meet the requirements in subsection (4)(a)(iii) of this section, and are appropriate for demonstrating equivalency.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-14533, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-14533, filed 11/30/87. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-14533, filed 7/25/86; 82-03-023 (Order 82-1), § 296-62-14533, filed 1/15/82. Statutory Authority: 49.17.040, 49.17.050, and 49.17.240. 81-16-015 (Order 81-20), § 296-62-14533, filed 7/27/81. Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-14533, filed 11/13/80.]

WAC 296-62-14535 Appendix A—Air sampling and analytical procedures for determining concentrations of cotton dust. (1) Sampling locations. The sampling procedures must be designed so that samples of the actual dust concentrations are collected accurately and consistently and reflect the concentrations of dust at the place and time of sampling. Sufficient number of six-hour area samples in each distinct work area of the plant should be collected at locations which provide representative samples of air to which the worker is exposed. In order to avoid filter overloading, sampling time may be shortened when sampling in dusty areas. Samples in each work area should be gathered simultaneously or sequentially during a normal operating period. The daily time-weighted average (TWA) exposure of each worker can then be determined by using the following formula:

$$\frac{\text{Summation of hours spent in each location and the dust concentration in that location.}}{\text{Total hours exposed}}$$

A time-weighted average concentration should be computed for each worker and properly logged and maintained on file for review.

(2) Sampling equipment.

(a) Sampler. The instrument selected for monitoring is the Lumsden-Lynch vertical elutriator. It should operate at a flow rate of 7.4 ± 0.2 liters/minute. The samplers should be cleaned prior to sampling. The pumps should be monitored during sampling.

(b) Filter holder. A three-piece cassette constructed of polystyrene designed to hold a 37-mm diameter filter should be used. Care must be exercised to insure that an adequate seal exists between elements of the cassette.

(c) Filters and support pads. The membrane filters used should be polyvinyl chloride with a 5-um pore size and 37-mm diameter. A support pad, commonly called a backup pad, should be used under the filter membrane in the field monitor cassette.

(d) Balance. A balance sensitive to 10 micrograms should be used.

(3) Instrument calibration procedure. Samplers shall be calibrated when first received from the factory, after repair, and after receiving any abuse. The samplers should be calibrated in the laboratory both before they are used in the field and after they have been used to collect a large number of field samples. The primary standard, such as a spirometer or

other standard calibrating instruments such as a wet test meter or a large bubble meter or dry gas meter, should be used. Instructions for calibration with the wet test meter follow. If another calibration device is selected, equivalent procedures should be used:

(a) Level wet test meter. Check the water level which should just touch the calibration point at the left side of the meter. If water level is low, add water 1-2°F. warmer than room temperature of till point. Run the meter for thirty minutes before calibration;

(b) Place the polyvinyl chloride membrane filter in the filter cassette;

(c) Assemble the calibration sampling train;

(d) Connect the wet test meter to the train.

The pointer on the meter should run clockwise and a pressure drop of not more than 1.0 inch of water indicated. If the pressure drop is greater than 1.0, disconnect and check the system;

(e) Operate the system for ten minutes before starting the calibration;

(f) Check the vacuum gauge on the pump to insure that the pressure drop across the orifice exceeds seventeen inches of mercury;

(g) Record the following on calibration data sheets:

(i) Wet test meter reading, start and finish;

(ii) Elapsed time, start and finish (at least two minutes);

(iii) Pressure drop at manometer;

(iv) Air temperature;

(v) Barometric pressure; and

(vi) Limiting orifice number.

(h) Calculate the flow rate and compare against the flow of 7.4 ± 0.2 liters/minute. If flow is between these limits, perform calibration again, average results, and record orifice number and flow rate. If flow is not within these limits, discard or modify orifice and repeat procedure;

(i) Record the name of the person performing the calibration, the date, serial number of the wet test meter, and the number of the critical orifices being calibrated.

(4) Sampling procedure.

(a) Sampling data sheets should include a log of:

(i) The date of the sample collection;

(ii) The time of sampling;

(iii) The location of the sampler;

(iv) The sampler serial number;

(v) The cassette number;

(vi) The time of starting and stopping the sampling and the duration of sampling;

(vii) The weight of the filter before and after sampling;

(viii) The weight of dust collected (corrected for controls);

(ix) The dust concentration measured;

(x) Other pertinent information; and

(xi) Name of person taking sample.

(b) Assembly of filter cassette should be as follows:

(i) Loosely assemble three-piece cassette;

(ii) Number cassette;

(iii) Place absorbent pad in cassette;

(iv) Weigh filter to an accuracy of 10 µg;

(v) Place filter in cassette;

(vi) Record weight of filter in log, using cassette number for identification;

(vii) Fully assemble cassette, using pressure to force parts tightly together;

(viii) Install plugs top and bottom;

(ix) Put shrink band on cassette, covering joint between center and bottom parts of cassette; and

(x) Set cassette aside until shrink band dries thoroughly.

(c) Sampling collection should be performed as follows:

(i) Clean lint out of the motor and elutriator;

(ii) Install vertical elutriator in sampling locations specified above with inlet 4-1/2 to 5-1/2 feet from floor (breathing zone height);

(iii) Remove top section of cassette;

(iv) Install cassette in ferrule of elutriator;

(v) Tape cassette to ferrule with masking tape or similar material for air-tight seal;

(vi) Remove bottom plug of cassette and attach hose containing critical orifice;

(vii) Start elutriator pump and check to see if gauge reads above 17 in. of Hg vacuum;

(viii) Record starting time, cassette number, and sampler number;

(ix) At end of sampling period stop pump and record time; and

(x) Controls with each batch of samples collected, two additional filter cassettes should be subjected to exactly the same handling as the samples, except that they are not opened. These control filters should be weighed in the same manner as the sample filters.

Any difference in weight in the control filters would indicate that the procedure for handling sample filters may not be adequate and should be evaluated to ascertain the cause of the difference, whether and what necessary corrections must be made, and whether additional samples must be collected.

(d) Shipping. The cassette with samples should be collected, along with the appropriate number of blanks, and shipped to the analytical laboratory in a suitable container to prevent damage in transit.

(e) Weighing of the sample should be achieved as follows:

(i) Remove shrink band;

(ii) Remove top and middle sections of cassette and bottom plug;

(iii) Remove filter from cassette and weigh to an accuracy of 10 μg ; and

(iv) Record weight in log against original weight.

(f) Calculation of volume of air sampled should be determined as follows:

(i) From starting and stopping times of sampling period, determine length of time in minutes of sampling period; and

(ii) Multiply sampling time in minutes by flow rate of critical orifice in liters per minute and divide by 1000 to find air quantity in cubic meters.

(g) Calculation of dust concentrations should be made as follows:

(i) Subtract weight of clean filter from dirty filter and apply control correction to find actual weight of sample. Record this weight (in μg) in log; and

(ii) Divide mass of sample in μg by air volume in cubic meters to find dust concentration in $\mu\text{g}/\text{m}$. Record in log.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.17.240, chapters 42.30 and 43.22 RCW. 80-17-014 (Order 80-20), § 296-62-14535, filed 11/13/80.]

WAC 296-62-14537 Appendix B-I through B-III—Respiratory questionnaire.

APPENDIX B-I
Respiratory Questionnaire

A. IDENTIFICATION DATA

PLANT _____ SOCIAL SECURITY NO. _____
DAY MONTH YEAR
(figures) (last 2 digits)

NAME _____ DATE OF INTERVIEW _____
(Surname)

(First Names) M F

ADDRESS _____ AGE _____ (8,9) SEX _____ (10)

 RACE W N INC. OTHER (11)

INTERVIEWER: 1 2 3 4 5 6 7 8 (12)

WORK SHIFT: 1st _____ 2nd _____ 3rd _____ (13) STANDING HEIGHT _____ (14,15)

PRESENT WORK AREA _____ WEIGHT _____ (16,18)

If working in more than one specified work area, X area where most of the work shift is spent. If "other," but spending 25% of the work shift in one of the specified work areas, classify in that work area. If carding department employee, check area within that department where most of the work shift is spent (if in doubt, check "throughout"). For work areas such as spinning and weaving where many work rooms may be involved, be sure to check the specific work room to which employee is assigned — if he works in more than one work room within a department classify as 7 (all) for that department.

	Workroom Number	(19) Open	(20) Pick	Area	(21) Card #1	(22) #2	(23) Spin	(24) Wind	(25) Twist	(26) Spool	(27) Warp	(28) Slash	(29) Weave	(30) Other
AT RISK (cotton & cotton blend)	1			Cards										
	2			Draw										
	3			Comb										
	4			Rove										
	5			Thru Out										
	6													
	7 (all)													
Control (synthetic & wool)	8													
Ex-Worker (cotton)	9													

Use actual wording of each question. Put X in appropriate square after each question. When in doubt record 'No'. When no square, circle appropriate answer.

B. COUGH

(on getting up)†
Do you usually cough first thing in the morning? _____ Yes _____ No _____ (31)
(Count a cough with first smoke or on "first going out of doors."
Exclude clearing throat or a single cough.)

Do you usually cough during the day or at night? _____ Yes _____ No _____ (32)
(Ignore an occasional cough.)

If 'Yes' to either question (31-32):

Do you cough like this on most days for as much as ~~three~~ months a year? _____ Yes _____ No _____ (33)

Do you cough on any particular day of the week? _____ Yes _____ No _____ (34)

(1) (2) (3) (4) (5) (6) (7) _____

If 'Yes': Which day? Mon. Tues. Wed.-Thur. Fri. Sat Sun. _____ (35)

C. PHLEGM or alternative word to suit local custom.

(on getting up)†
Do you usually bring up any phlegm from your chest first thing in the morning? (Count phlegm with the first smoke or on "first going out of doors." Exclude phlegm from the nose. Count swallowed phlegm.) _____ Yes _____ No _____ (36)

Do you usually bring up any phlegm from your chest during the day or at night? (Accept twice or more.) _____ Yes _____ No _____ (37)

If 'Yes' to either question (36) or (37):

Do you bring up phlegm like this on most days for as much as three months each year? _____ Yes _____ No _____ (38)

If 'Yes' to question (33) or (39):

- (cough)
How long have you had this phlegm?
(Write in number of years)
- (1) 2 years or less
 - (2) More than 2 years-9 years
 - (3) 10-19 years
 - (4) 20+ years

†These words are for subjects who work at night

D. CHEST ILLNESSES

- In the past three years, have you had a period of (increased) †cough and phlegm lasting for 3 weeks or more? _____
- (1) No (40)
 - (2) Yes, only one period
 - (3) Yes, two or more periods

†For subjects who usually have phlegm

During the past 3 years have you had any chest illness which has kept you off work, indoors at home or in bed? (For as long as one week, †flu?) _____ Yes _____ No _____ (41)

If 'Yes' to (41): Did you bring up (more) phlegm than usual in any of these illnesses? _____ Yes _____ No _____ (42)

If 'Yes' to (42): During the past three years have you had:
Only one such illness with increased phlegm? _____ (1) _____ (43)

More than one such illness: _____ (2) _____ (44)

Br. Grade _____

E. TIGHTNESS

Does your chest ever feel tight or your breathing become difficult? _____ Yes _____ No _____ (45)

Is your chest tight or your breathing difficult on any particular day of the week? (after a week or 10 days away from the mill) _____ Yes _____ No _____ (46)

If 'Yes': Which day? Mon. (1) Sometimes (3) Tues. (4) Wed. (5) Thur. (6) Fri. (7) Sat. (8) Sun. (47) Always (2)

If 'Yes' Monday: At what time on Monday does your chest feel tight or your breathing difficult? 1 Before entering the mill (48) 2 After entering the mill

(Ask only if NO to Question (45))

In the past, has your chest ever been tight or your breathing difficult on any particular day of the week? _____ Yes _____ No _____ (49)

If 'Yes': Which day? Mon. (1) Sometimes (3) Tues. (4) Wed. (5) Thur. (6) Fri. (7) Sat. (8) Sun. (50) Always (2)

F. BREATHLESSNESS

If disabled from walking by any condition other than heart or lung disease put "X" here and leave questions (52-60) unasked. (51)

Are you ever troubled by shortness of breath, when hurrying on the level or walking up a slight hill? _____ Yes _____ No _____ (52)

If 'No', grade is 1. If 'Yes' proceed to next question

Do you get short of breath walking with other people at an ordinary pace on the level? _____ Yes _____ No _____ (53)

If 'No', grade is 2. If 'Yes', proceed to next question

Do you have to stop for breath when walking at your own pace on the level? _____ Yes _____ No _____ (54)

If 'No', grade is 3. If 'Yes', proceed to next question

Are you short of breath on washing or dressing? _____ Yes _____ No _____ (55)

If 'No', grade is 4. If 'Yes', grade is 5.

Dyspnea Grd. _____ (56)

ON MONDAYS:

Are you ever troubled by shortness of breath, when hurrying on the level or walking up a slight hill? _____ Yes _____ No _____ (57)

If 'No', grade is 1. If 'Yes', proceed to next question

Do you get short of breath walking with other people at an ordinary pace on the level? _____ Yes _____ No _____ (58)

If 'No', grade is 2. If 'Yes', proceed to next question

Do you have to stop for breath when walking at your own pace on the level? _____ Yes _____ No _____ (59)

If 'No', grade is 3. If 'Yes', proceed to next question

Are you short of breath on washing or dressing? _____ Yes _____ No _____ (60)

If 'No', grade is 4. If 'Yes', grade is 5

B. Grd. _____ (61)

G. OTHER ILLNESSES AND ALLERGY HISTORY

Do you have a heart condition for which you are under a doctor's care? _____ Yes _____ No _____ (62)

Have you ever had asthma? _____ Yes _____ No _____ (63)

If 'Yes', did it begin: (1) Before age 30
 (2) After age 30

If 'Yes' before 30: did you have asthma before ever going to work in a textile mill? _____ Yes _____ No _____ (64)

Have you ever had hay fever or other allergies (other than above)? _____ Yes _____ No _____ (65)

H. TOBACCO SMOKING*

Do you smoke?

Record 'Yes' if regular smoker up to one month ago. (Cigarettes, cigar or pipe) _____ Yes _____ No _____ (66)

If 'No' to (63)

Have you ever smoked? (Cigarettes, cigars, pipe. Record 'No' if subject has never smoked as much as one cigarette a day, or 1 oz. of tobacco a month, for as long as one year.) _____ Yes _____ No _____ (67)

If 'Yes' to (63) or (64); what have you smoked and for how many years? (Write in specific number of years in the appropriate square)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Years	(<5)	(5-9)	(10-14)	(15-19)	(20-24)	(25-29)	(30-34)	(35-39)	(>40)	
Cigarettes										(68)
Pipe										(69)
Cigars										(70)

If cigarettes, how many packs per day? (Write in number of cigarettes)

- (1) less than 1/2 pack (71)
- (2) 1/2 pack, but less than 1 pack
- (3) 1 pack, but less than 1-1/2 packs
- (4) 1-1/2 packs or more

Number of pack years: _____ (72,73)

If an ex-smoker (cigarettes, cigar or pipe), how long since you stopped? _____ (74)
 (Write in number of years)

- (1) 0-1 year
- (2) 1-4 years
- (3) 5-9 years
- (4) 10+ years

*Have you changed your smoking habits since last interview? If yes, specify what changes.

L. OCCUPATIONAL HISTORY**

Have you ever worked in: A foundry? (As long as one year) _____ Yes _____ No _____ (75)

Stone or mineral mining, quarrying or processing? (As long as one year) _____ Yes _____ No _____ (76)

Asbestos milling or processing? (Ever) _____ Yes _____ No _____ (77)

Other dusts, fumes or smoke? If yes, specify: _____ Yes _____ No _____ (78)

Type of exposure _____

Length of exposure _____

**Ask only on first interview.

At what age did you first go to work in a textile mill? (Write in specific age in appropriate square).

(1)	(2)	(3)	(4)	(5)	(6)	
<20	20-24	25-29	30-34	35-39	40+	
						(79)

When you first worked in a textile mill, did you work with (1) Cotton or cotton blend (80)
 (2) Synthetic or wool

APPENDIX B-II
Respiratory Questionnaire for Nontextile Workers for the Cotton Industry

Identification No.

Interviewer Code

Location

Date of Interview

A. IDENTIFICATION

1. NAME (Last) (First) (Middle Initial)		3. PHONE NUMBER AREA CODE () NO.	4. SOCIAL SECURITY # (optional see below) []
2. CURRENT ADDRESS (Number, Street, or Rural Route, City or Town, County, State, Zip Code)		5. BIRTHDATE (Mo., Day, Yr.)	6. AGE LAST BIRTHDAY
		7. SEX 1 <input type="checkbox"/> Male 2 <input type="checkbox"/> Female	
		8. ETHNIC GROUP OR ANCESTRY 1. <input type="checkbox"/> White, not of Hispanic Origin 2. <input type="checkbox"/> Black, not of Hispanic Origin 3. <input type="checkbox"/> Hispanic 4. <input type="checkbox"/> American Indian or Alaskan Native 5. <input type="checkbox"/> Asian or Pacific Islander 6. <input type="checkbox"/> Other: _____	
9. STANDING HEIGHT _____ (cm)	10. WEIGHT _____	11. WORK SHIFT 1st <input type="checkbox"/> 2nd <input type="checkbox"/> 3rd <input type="checkbox"/>	

12. PRESENT WORK AREA
Please indicate primary assigned work area and percent of time spent at that site. If at other locations, please indicate and note percent of time for each.

PRIMARY WORK AREA	_____
SPECIFIC JOB	_____

13. APPROPRIATE INDUSTRY

1 <input type="checkbox"/> Garnetting	3 <input type="checkbox"/> Cotton Warehouse	5 <input type="checkbox"/> Cotton Classification
2 <input type="checkbox"/> Cottonseed Oil Mill	4 <input type="checkbox"/> Utilization	6 <input type="checkbox"/> Cotton Ginning

(Furnishing your Social Security number is voluntary. Your refusal to provide this number will not affect any right, benefit, or privilege to which you would be entitled if you did provide your Social Security number. Your Social Security number is being requested since it will permit use in future determinations in statistical research studies.)

C. SYMPTOMS

Use actual wording of each question. Put X in appropriate square after each question. When in doubt record "No".

COUGH

1. Do you usually cough first thing in the morning?
(on getting up)*
(Count a cough with first smoke or on "first going out of doors". Exclude clearing throat or a single cough.)

1 Yes 2 No

2. Do you usually cough during the day or at night?
(Ignore an occasional cough.)

1 Yes 2 No

If YES to either question 1 or 2:

3. Do you cough like this on most days for as much as three months a year?

1 Yes 2 No 9 NA

4. Do you cough on any particular day of the week?

1 Yes 2 No

If YES:

5. Which day? Mon. Tue. Wed. Thur. Fri. Sat. Sun. _____

PHLEGM

6. Do you usually bring up any phlegm from your chest first thing in the morning? (on getting up)* (Count phlegm with the first smoke or on "first going out of doors." Exclude phlegm from the nose. Count swallowed phlegm.)

1 Yes 2 No

7. Do you usually bring up any phlegm from your chest during the day or at night?
(Accept twice or more.)

1 Yes 2 No

If YES to either question 6 or 7:

8. Do you bring up phlegm like this on most days for as much as three months each year?

1 Yes 2 No

If YES to question 3 or 8:

9. How long have you had this phlegm? (cough)
(Write in number of years)

(1) 2 years or less
 (2) More than 2 years - 9 years
 (3) 10-19 years
 (4) 20+ years

*These words are for subjects who work at night

CHEST ILLNESS

10. In the past three years, have you had a period of (increased) cough and phlegm lasting for 3 weeks or more? (1) No
 (2) Yes, only one period
 (3) Yes, two or more periods

For subjects who usually have phlegm:

11. During the past 3 years have you had any chest illness which has kept you off work, indoors at home or in bed? (For as long as one week, flu?) 1 Yes 2 No

If YES to 11:

12. Did you bring up (more) phlegm than usual in any of these illnesses? 1 Yes 2 No

If YES to 12: During the past three years have you had:

13. Only one such illness with increased phlegm? 1 Yes 2 No

14. More than one such illness: 1 Yes 2 No

Br. Grade _____

TIGHTNESS

15. Does your chest ever feel tight or your breathing become difficult? 1 Yes 2 No

16. Is your chest tight or your breathing difficult on any particular day of the week? (after a week or 10 days away from the mill) 1 Yes 2 No

17. If YES, Which day? Mon. (1) Sometimes (3) Tues. (2) Always (4) Wed. (5) Thur. (6) Fri. (7) Sat. (8) Sun.

18. If YES Monday: At what time on Monday does your chest feel tight or your breathing difficult? Before entering mill
 After entering mill

(ASK ONLY IF NO TO QUESTION 15)

19. In the past, has your chest ever been tight or your breathing difficult on any particular day of the week? 1 Yes 2 No

20. If YES, Which day? Mon. (1) Sometimes (3) Tues. (2) Always (4) Wed. (5) Thur. (6) Fri. (7) Sat. (8) Sun.

BREATHLESSNESS

21. If disabled from walking by any condition other than heart or lung disease put "X" in the space and leave questions (22-30) unasked.
22. Are you ever troubled by shortness of breath, when hurrying on the level or walking up a slight hill? 1 Yes 2 No

If NO, grade is 1. If YES, proceed to next question

23. Do you get short of breath walking with other people at an ordinary pace on the level? 1 Yes 2 No

If NO, grade is 2. If YES, proceed to next question

24. Do you have to stop for breath when walking at your own pace on the level? 1 Yes 2 No

If NO, grade is 3. If YES, proceed to next question

25. Are you short of breath on washing or dressing? 1 Yes 2 No

If NO, grade is 4. If YES, grade is 5.

26. Dyspnea Grd. _____

ON MONDAYS:

27. Are you ever troubled by shortness of breath, when hurrying on the level or walking up a slight hill? 1 Yes 2 No

If NO, grade is 1. If YES, proceed to next question

28. Do you get short of breath walking with other people at an ordinary pace on the level? 1 Yes 2 No

If NO, grade is 2, If YES, proceed to next question

29. Do you have to stop for breath when walking at your own pace on the level? 1 Yes 2 No

If NO, grade is 3. If YES, proceed to next question

30. Are you short of breath on washing or dressing? 1 Yes 2 No

If NO, grade is 4. If YES, grade is 5

31. B. Grd. _____

OTHER ILLNESSES AND ALLERGY HISTORY

32. Do you have a heart condition for which you are under a doctor's care? 1 Yes 2 No

OTHER ILLNESSES AND ALLERGY HISTORY CONTINUED:

33. Have you ever had asthma? 1 Yes 2 No
 If yes, did it begin: (1) Before age 30
 (2) After age 30
34. If yes before 30: did you have asthma before ever going to work in a textile mill? 1 Yes 2 No
35. Have you ever had hay fever or other allergies (other than above)? 1 Yes 2 No

TOBACCO SMOKING

36. Do you smoke? 1 Yes 2 No
 Record Yes if regular smoker up to one month ago. (Cigarettes, cigar or pipe)
- If NO to (33).
37. Have you ever smoked? (Cigarettes, cigars, pipe. Record NO if subject has never smoked as much as one cigarette a day, or 1 oz. of tobacco a month, for as long as one year.) 1 Yes 2 No

If Yes to (33) or (34); what have you smoked for how many years? (Write in specific number of years in the appropriate square)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Years	(<5)	(5-9)	(10-14)	(15-19)	(20-24)	(25-29)	(30-34)	(35-39)	(>40)
38. Cigarettes									
39. Pipe									
40. Cigars									

41. If cigarettes, how many packs per day? Less than 1/2 pack
 Write in number of cigarettes _____ 1/2 pack, but less than 1 pack
 1 pack, but less than 1 1/2 packs
 1-1/2 packs or more
42. Number of pack years: _____
43. If an ex-smoker (cigarettes, cigar or pipe), how long since you stopped? (Write in number of years.) _____
 0-1 year
 1-4 years
 5-9 years
 10+ years

OCCUPATIONAL HISTORY

Have you ever worked in:

- 44. A foundry? (As long as one year) 1 Yes 2 No
- 45. Stone or mineral mining, quarrying or
processing? (As long as one year) 1 Yes 2 No
- 46. Asbestos milling or processing? (Ever) 1 Yes 2 No
- 47. Cotton or cotton blend mill? (For controls only) 1 Yes 2 No
- 48. Other dusts, fumes or smoke? If yes, specify. 1 Yes 2 No

Type of exposure _____

Length of exposure _____

APPENDIX B III
Abbreviated Respiratory Questionnaire

A. IDENTIFICATION DATA

PLANT _____ SOCIAL SECURITY NO. _____
DAY MONTH YEAR
(figures) (last 2 digits)

NAME _____ DATE OF INTERVIEW _____
(Surname)

(First Names) DATE OF BIRTH _____
M P

ADDRESS _____ AGE _____ (18,9) SEX _____ (10)

RACE W N IND OTHER (11)

INTERVIEWER: 1 2 3 4 5 6 7 8 (12)

WORK SHIFT: 1st _____ 2nd _____ 3rd _____ (13) STANDING HEIGHT _____ (14,15)

PRESENT WORK AREA _____ WEIGHT _____ (16,18)

If working in more than one specified work area, X area where most of the work shift is spent. If "other," but spending 25% of the work shift in one of the specified work areas, classify in that work area. If carding department employee, check area within that department where most of the work shift is spent (if in doubt, check "throughout"). For work areas such as spinning and weaving where many work rooms may be involved, be sure to check the specific work room to which employee is assigned — if he works in more than one work room within a department classify as 7 (all) for that department.

	Workroom Number	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
		Open	Pick	Area	Card #1	#2	Spin	Wind	Twist	Spool	Warp	Slash	Weave	Other
AT RISK (cotton & cotton blend)	1			Cards									
	2			Draw									
	3			Comb									
	4			Rove									
	5			Thru Out									
	6												
	7 (all)												
Control (synthetic & wool)	8												
Ex-Worker (cotton)	9												

Use actual wording of each question. Put X in appropriate square after each question. When in doubt record "No". When no square, circle appropriate answer.

B. COUGH

(on getting up)†
Do you usually cough first thing in the morning? Yes No (31)
(Count a cough with first smoke or on "first going out of doors." Exclude clearing throat or a single cough.)

Do you usually cough during the day or at night? Yes No (32)
(Ignore an occasional cough.)

If 'Yes' to either question (31-32):

Do you cough like this on most days for as much as three months a year? Yes No (33)

Do you cough on any particular day of the week? Yes No (34)

(1) (2) (3) (4) (5) (6) (7)

If 'Yes': Which day? Mon. Tues. Wed. Thur. Fri. Sat. Sun. (35)

C. PHLEGM or alternative word to suit local custom.

(on getting up)†
Do you usually bring up any phlegm from your chest first thing in the morning? Yes No (36)
(Count phlegm with the first smoke or on "first going out of doors." Exclude phlegm from the nose. Count swallowed phlegm.)

Do you usually bring up any phlegm from your chest during the day or at night? (Accept twice or more.) Yes No (37)

If 'Yes' to either question (36) or (37):

Do you bring up phlegm like this on most days for as much as three months each year? Yes No (38)

If 'Yes' to question (33) or (33):

How long have you had this phlegm? (cough)
(Write in number of years)
(1) [] 2 years or less
(2) [] More than 2 years-9 years
(3) [] 10-19 years
(4) [] 20+ years

†These words are for subjects who work at night

D. TIGHTNESS

Does your chest ever feel tight or your breathing become difficult? Yes No (39)

Is your chest tight or your breathing difficult on any particular day of the week? (after a week or 10 days away from the mill) Yes No (40)

If 'Yes': Which day? Mon. Tues. Wed. Thur. Fri. Sat. Sun. (41)
(1) Sometimes (2) Always

If 'Yes' Monday: At what time on Monday does your chest feel tight or your breathing difficult?
1 [] Before entering the mill (42)
2 [] After entering the mill

(Ask only if NO to Question (45)†

In the past, has your chest ever been tight or your breathing difficult on any particular day of the week? Yes No (43)

If 'Yes': Which day? Mon. Tues. Wed. Thur. Fri. Sat. Sun. (44)
(1) Sometimes (2) Always

E. TOBACCO SMOKING*

*Have you changed your smoking habits since last interview? If yes specify what changes.

[Statutory Authority: Chapter 49.17 RCW. 87-24-051 (Order 87-24), § 296-62-14537, filed 11/30/87.]

WAC 296-62-14539 Appendix C—Spirometry prediction tables for normal males and females.

TABLE 1. PREDICTED FVC FOR MALES (KNUDSON, ET AL: AM REV RESPIR DIS. 1976. 113. 587.)

HT	AGE																								
	17	19	21	23	25	27	29	31	33	35															
60.0	3.44	3.59	3.75	3.91	3.72	3.66	3.61	3.55	3.49	3.43	3.37	3.32	3.26	3.20	3.14	3.08	3.03	2.97	2.91	2.85	2.79	2.74	2.68	2.62	2.56
60.5	3.50	3.66	3.81	3.97	3.80	3.75	3.69	3.63	3.57	3.51	3.46	3.40	3.34	3.28	3.22	3.17	3.11	3.05	2.99	2.93	2.88	2.82	2.76	2.70	2.64
61.0	3.56	3.72	3.88	4.03	3.89	3.83	3.77	3.71	3.66	3.60	3.54	3.48	3.42	3.37	3.31	3.25	3.19	3.13	3.08	3.02	2.96	2.90	2.84	2.79	2.73
61.5	3.63	3.78	3.94	4.10	3.97	3.91	3.85	3.80	3.74	3.68	3.62	3.56	3.51	3.45	3.39	3.33	3.27	3.22	3.16	3.10	3.04	2.98	2.93	2.87	2.81
62.0	3.69	3.85	4.00	4.16	4.05	3.99	3.94	3.88	3.82	3.76	3.70	3.65	3.59	3.53	3.47	3.41	3.36	3.30	3.24	3.18	3.12	3.07	3.01	2.95	2.89
62.5	3.76	3.91	4.07	4.22	4.13	4.08	4.02	3.96	3.90	3.84	3.79	3.73	3.67	3.61	3.55	3.50	3.44	3.38	3.32	3.26	3.21	3.15	3.09	3.03	2.97
63.0	3.82	3.97	4.13	4.29	4.22	4.16	4.10	4.04	3.99	3.93	3.87	3.81	3.75	3.70	3.64	3.58	3.52	3.46	3.41	3.35	3.29	3.23	3.17	3.12	3.06
63.5	3.88	4.04	4.19	4.35	4.30	4.24	4.18	4.13	4.07	4.01	3.95	3.89	3.84	3.78	3.72	3.66	3.60	3.55	3.49	3.43	3.37	3.31	3.26	3.20	3.14
64.0	3.95	4.10	4.26	4.41	4.30	4.22	4.21	4.15	4.09	4.03	3.98	3.92	3.86	3.80	3.74	3.69	3.63	3.57	3.51	3.45	3.40	3.34	3.28	3.22	3.16
64.5	4.01	4.17	4.32	4.48	4.46	4.41	4.35	4.29	4.23	4.17	4.12	4.06	4.00	3.94	3.88	3.83	3.77	3.71	3.65	3.59	3.54	3.48	3.42	3.36	3.30
65.0	4.07	4.23	4.39	4.54	4.55	4.49	4.43	4.37	4.32	4.26	4.20	4.14	4.08	4.03	3.97	3.91	3.85	3.79	3.74	3.68	3.62	3.56	3.50	3.45	3.39
65.5	4.14	4.29	4.45	4.60	4.63	4.57	4.51	4.46	4.40	4.34	4.28	4.22	4.17	4.11	4.05	3.99	3.93	3.88	3.82	3.76	3.70	3.64	3.59	3.53	3.47
66.0	4.20	4.36	4.51	4.67	4.71	4.65	4.60	4.54	4.48	4.42	4.36	4.31	4.25	4.19	4.13	4.07	4.02	3.96	3.90	3.84	3.78	3.73	3.67	3.61	3.55
66.5	4.26	4.42	4.58	4.73	4.80	4.74	4.68	4.62	4.56	4.51	4.45	4.39	4.33	4.27	4.22	4.16	4.10	4.04	3.98	3.93	3.87	3.81	3.75	3.69	3.64
67.0	4.33	4.48	4.64	4.80	4.86	4.80	4.76	4.70	4.65	4.59	4.53	4.47	4.41	4.36	4.30	4.24	4.18	4.12	4.07	4.01	3.95	3.89	3.83	3.78	3.72
67.5	4.39	4.55	4.70	4.86	4.90	4.84	4.79	4.73	4.67	4.61	4.55	4.50	4.44	4.38	4.32	4.26	4.21	4.15	4.09	4.03	3.97	3.92	3.86	3.80	3.74
68.0	4.45	4.61	4.77	4.92	5.04	4.98	4.93	4.87	4.81	4.75	4.69	4.64	4.58	4.52	4.46	4.40	4.35	4.29	4.23	4.17	4.11	4.06	4.00	3.94	3.88
68.5	4.52	4.67	4.83	4.99	5.13	5.07	5.01	4.95	4.89	4.84	4.78	4.72	4.66	4.60	4.55	4.49	4.43	4.37	4.31	4.26	4.20	4.14	4.08	4.02	3.97
69.0	4.58	4.74	4.89	5.05	5.21	5.15	5.09	5.03	4.98	4.92	4.86	4.80	4.74	4.69	4.63	4.57	4.51	4.45	4.40	4.34	4.28	4.22	4.16	4.11	4.05
69.5	4.64	4.80	4.96	5.11	5.29	5.23	5.17	5.12	5.06	5.00	4.94	4.88	4.83	4.77	4.71	4.65	4.59	4.54	4.48	4.42	4.36	4.30	4.25	4.19	4.13
70.0	4.71	4.86	5.02	5.18	5.37	5.32	5.26	5.20	5.14	5.08	5.02	4.97	4.91	4.85	4.79	4.74	4.68	4.62	4.56	4.50	4.44	4.39	4.33	4.27	4.21
70.5	4.77	4.93	5.08	5.24	5.46	5.40	5.34	5.28	5.22	5.17	5.11	5.05	4.99	4.93	4.88	4.82	4.76	4.70	4.64	4.59	4.53	4.47	4.41	4.35	4.30
71.0	4.83	4.99	5.15	5.30	5.54	5.48	5.42	5.36	5.31	5.25	5.19	5.13	5.07	5.02	4.96	4.90	4.84	4.78	4.73	4.67	4.61	4.55	4.49	4.44	4.38
71.5	4.90	5.05	5.21	5.37	5.62	5.56	5.50	5.45	5.39	5.33	5.27	5.21	5.16	5.10	5.04	4.98	4.92	4.87	4.81	4.75	4.69	4.64	4.58	4.52	4.46
72.0	4.96	5.12	5.27	5.43	5.70	5.65	5.59	5.53	5.47	5.41	5.36	5.30	5.24	5.18	5.12	5.07	5.01	4.95	4.89	4.83	4.78	4.72	4.66	4.60	4.54
72.5	5.03	5.18	5.34	5.49	5.79	5.73	5.67	5.61	5.55	5.50	5.44	5.38	5.32	5.26	5.21	5.15	5.09	5.03	4.97	4.92	4.86	4.80	4.74	4.68	4.63
73.0	5.09	5.24	5.40	5.56	5.87	5.81	5.75	5.69	5.64	5.58	5.52	5.46	5.40	5.35	5.29	5.23	5.17	5.11	5.06	5.00	4.94	4.88	4.82	4.77	4.71
73.5	5.15	5.31	5.46	5.62	5.95	5.89	5.83	5.78	5.72	5.66	5.60	5.54	5.49	5.43	5.37	5.31	5.25	5.20	5.14	5.08	5.02	4.96	4.91	4.85	4.79
74.0	5.22	5.37	5.53	5.68	6.03	5.98	5.92	5.86	5.80	5.74	5.69	5.63	5.57	5.51	5.45	5.40	5.34	5.28	5.22	5.16	5.11	5.05	4.99	4.93	4.87
74.5	5.28	5.44	5.59	5.75	6.12	6.06	6.00	5.94	5.88	5.83	5.77	5.71	5.65	5.59	5.54	5.48	5.42	5.36	5.30	5.25	5.19	5.13	5.07	5.01	4.96
75.0	5.34	5.50	5.65	5.81	6.20	6.14	6.08	6.02	5.97	5.91	5.85	5.79	5.73	5.68	5.62	5.56	5.50	5.44	5.39	5.33	5.27	5.21	5.15	5.10	5.04
75.5	5.41	5.56	5.72	5.87	6.28	6.22	6.17	6.11	6.05	5.99	5.93	5.88	5.82	5.76	5.70	5.64	5.59	5.53	5.47	5.41	5.35	5.30	5.24	5.18	5.12
76.0	5.47	5.63	5.78	5.94	6.36	6.31	6.25	6.19	6.13	6.07	6.02	5.96	5.90	5.84	5.78	5.73	5.67	5.61	5.55	5.49	5.44	5.38	5.32	5.26	5.20
76.5	5.53	5.69	5.85	6.00	6.45	6.39	6.33	6.27	6.21	6.16	6.10	6.04	5.98	5.92	5.87	5.81	5.75	5.69	5.63	5.58	5.52	5.46	5.40	5.34	5.29
77.0	5.60	5.75	5.91	6.06	6.53	6.47	6.41	6.35	6.30	6.24	6.18	6.12	6.06	6.01	5.95	5.89	5.83	5.77	5.72	5.66	5.60	5.54	5.48	5.43	5.37
77.5	5.66	5.82	5.97	6.13	6.61	6.55	6.50	6.44	6.38	6.32	6.26	6.21	6.15	6.09	6.03	5.97	5.92	5.86	5.80	5.74	5.68	5.63	5.57	5.51	5.45
78.0	5.72	5.88	6.04	6.19	6.69	6.64	6.58	6.52	6.46	6.40	6.35	6.29	6.23	6.17	6.11	6.06	6.00	5.94	5.88	5.82	5.77	5.71	5.65	5.59	5.53
78.5	5.79	5.94	6.10	6.26	6.78	6.72	6.66	6.60	6.54	6.49	6.43	6.37	6.31	6.25	6.20	6.14	6.08	6.02	5.96	5.91	5.85	5.79	5.73	5.67	5.62
79.0	5.85	6.01	6.16	6.32	6.86	6.80	6.74	6.68	6.63	6.57	6.51	6.45	6.39	6.34	6.28	6.22	6.16	6.10	6.05	5.99	5.93	5.87	5.81	5.76	5.70
79.5	5.91	6.07	6.23	6.38	6.94	6.88	6.83	6.77	6.71	6.65	6.59	6.54	6.48	6.42	6.36	6.30	6.25	6.19	6.13	6.07	6.01	5.96	5.90	5.84	5.78
80.0	5.98	6.13	6.29	6.45	7.02	6.97	6.91	6.85	6.79	6.73	6.68	6.62	6.56	6.50	6.44	6.39	6.33	6.27	6.21	6.15	6.10	6.04	5.99	5.92	5.86
80.5	6.04	6.20	6.35	6.51	7.11	7.05	6.99	6.93	6.87	6.82	6.76	6.70	6.64	6.58	6.53	6.47	6.41	6.35	6.29	6.24	6.18	6.12	6.06	6.00	5.95
81.0	6.10	6.26	6.42	6.57	7.19	7.13	7.07	7.02	6.96	6.90	6.84	6.78	6.73	6.67	6.61	6.55	6.49	6.44	6.38	6.32	6.26	6.20	6.15	6.09	6.03
81.5	6.17	6.32	6.48	6.64	7.27	7.21	7.16	7.10	7.04	6.98	6.92	6.87	6.81	6.75	6.69	6.63	6.58	6.52	6.46	6.40	6.34	6.29	6.23	6.17	6.11
82.0	6.23	6.39	6.54	6.70	7.35	7.30	7.24	7.18	7.12	7.06	7.01	6.95	6.89	6.83	6.77	6.72	6.66	6.60	6.54	6.48	6.43	6.37	6.31	6.25	6.19
82.5	6.30	6.45	6.61	6.76	7.44	7.38	7.32	7.26	7.20	7.15	7.09	7.03	6.97	6.91	6.86	6.80	6.74	6.68	6.62	6.57	6.51	6.45	6.39	6.33	6.28
83.0	6.36	6.51	6.67	6.83	7.52	7.46	7.40	7.35	7.29	7.23	7.17	7.11	7.06	7.00	6.94	6.88	6.82	6.77	6.71	6.65	6.59	6.53	6.47	6.42	6.36
83.5	6.42	6.58	6.73	6.89	7.60	7.54	7.49	7.43	7.37	7.31	7.25	7.20	7.14	7.08	7.02	6.96	6.91	6.85	6.79	6.73	6.67	6.62	6.56	6.50	6.44
84.0	6.49	6.64	6.80	6.95	7.68	7.63	7.57	7.51	7.45	7.39	7.34	7.28	7.22	7.16	7.10	7.05	6.99	6.93	6.87	6.81	6.76	6.70	6.64	6.58	6.52
84.5	6.55	6.71	6.86	7.02	7.77	7.71	7.65	7.59	7.53	7.47	7.42	7.36	7.30	7.24	7.19	7.13	7.07	7.01	6.95	6.90	6.84	6.78	6.72	6.66	6.61
85.0	6.61	6.77	6.92	7.08	7.85	7.79																			

TABLE 2. PREDICTED FEV1 FOR MALES (KHUDDSON, ET AL.; AM REV RESPIR DIS, 1976, 113, 567.)

HT	AGE																								
	17	19	21	23	25	27	29	31	33	35															
60.0	2.97	3.06	3.15	3.24	3.05	2.99	2.94	2.88	2.83	2.78	2.72	2.67	2.61	2.56	2.51	2.45	2.40	2.34	2.29	2.24	2.18	2.13	2.07	2.02	1.97
60.5	3.03	3.12	3.21	3.30	3.11	3.06	3.00	2.95	2.90	2.84	2.79	2.73	2.68	2.63	2.57	2.52	2.46	2.41	2.36	2.30	2.25	2.19	2.14	2.09	2.03
61.0	3.08	3.17	3.26	3.35	3.18	3.12	3.07	3.02	2.96	2.91	2.85	2.80	2.75	2.69	2.64	2.58	2.53	2.48	2.42	2.37	2.31	2.26	2.21	2.15	2.10
61.5	3.14	3.23	3.32	3.41	3.24	3.19	3.14	3.08	3.03	2.97	2.92	2.87	2.81	2.76	2.70	2.65	2.60	2.54	2.49	2.43	2.38	2.33	2.27	2.22	2.16
62.0	3.20	3.29	3.38	3.47	3.31	3.26	3.20	3.15	3.09	3.04	2.99	2.93	2.88	2.82	2.77	2.72	2.66	2.61	2.55	2.50	2.45	2.39	2.34	2.28	2.23
62.5	3.26	3.35	3.44	3.53	3.38	3.32	3.27	3.22	3.16	3.11	3.05	3.00	2.95	2.89	2.84	2.78	2.73	2.68	2.62	2.57	2.51	2.46	2.41	2.35	2.30
63.0	3.32	3.41	3.50	3.59	3.44	3.39	3.34	3.28	3.23	3.17	3.12	3.07	3.01	2.96	2.90	2.85	2.80	2.74	2.69	2.63	2.58	2.53	2.47	2.42	2.36
63.5	3.38	3.47	3.56	3.65	3.51	3.46	3.40	3.35	3.29	3.24	3.19	3.13	3.08	3.02	2.97	2.92	2.86	2.81	2.75	2.70	2.65	2.59	2.54	2.48	2.43
64.0	3.43	3.52	3.61	3.70	3.58	3.52	3.47	3.41	3.36	3.31	3.25	3.20	3.14	3.09	3.04	2.98	2.93	2.87	2.82	2.77	2.71	2.66	2.60	2.55	2.50
64.5	3.49	3.58	3.67	3.76	3.64	3.59	3.53	3.48	3.43	3.37	3.32	3.26	3.21	3.16	3.10	3.05	2.99	2.94	2.89	2.83	2.78	2.72	2.67	2.62	2.56
65.0	3.55	3.64	3.73	3.82	3.71	3.65	3.60	3.55	3.49	3.44	3.38	3.33	3.28	3.22	3.17	3.11	3.06	3.01	2.95	2.90	2.84	2.79	2.74	2.68	2.63
65.5	3.61	3.70	3.79	3.88	3.77	3.72	3.67	3.61	3.56	3.50	3.45	3.40	3.34	3.29	3.23	3.18	3.13	3.07	3.02	2.96	2.91	2.86	2.80	2.75	2.69
66.0	3.67	3.76	3.85	3.94	3.84	3.79	3.73	3.68	3.62	3.57	3.52	3.46	3.41	3.35	3.30	3.25	3.19	3.14	3.08	3.03	2.98	2.92	2.87	2.81	2.76
66.5	3.73	3.82	3.91	4.00	3.91	3.85	3.80	3.74	3.69	3.64	3.58	3.53	3.47	3.42	3.37	3.31	3.26	3.20	3.15	3.10	3.04	2.99	2.92	2.88	2.83
67.0	3.79	3.88	3.97	4.06	3.97	3.92	3.86	3.81	3.76	3.70	3.65	3.59	3.54	3.49	3.43	3.38	3.32	3.27	3.22	3.16	3.11	3.05	3.00	2.95	2.89
67.5	3.84	3.93	4.02	4.11	4.04	3.98	3.93	3.88	3.82	3.77	3.71	3.66	3.61	3.55	3.50	3.44	3.39	3.34	3.28	3.23	3.17	3.12	3.07	3.01	2.96
68.0	3.90	3.99	4.08	4.17	4.10	4.05	4.00	3.94	3.89	3.84	3.78	3.73	3.67	3.62	3.56	3.51	3.46	3.40	3.35	3.29	3.24	3.19	3.13	3.08	3.02
68.5	3.96	4.05	4.14	4.23	4.17	4.12	4.06	4.01	3.95	3.90	3.85	3.79	3.74	3.68	3.63	3.58	3.52	3.47	3.41	3.36	3.31	3.25	3.20	3.14	3.09
69.0	4.02	4.11	4.20	4.29	4.24	4.18	4.13	4.07	4.02	3.97	3.91	3.86	3.80	3.75	3.70	3.64	3.59	3.53	3.48	3.43	3.37	3.32	3.26	3.21	3.16
69.5	4.08	4.17	4.26	4.35	4.30	4.25	4.19	4.14	4.09	4.03	3.98	3.92	3.87	3.82	3.76	3.71	3.65	3.60	3.55	3.49	3.44	3.38	3.33	3.28	3.22
70.0	4.14	4.23	4.32	4.41	4.37	4.31	4.26	4.21	4.15	4.10	4.04	3.99	3.94	3.88	3.83	3.77	3.72	3.67	3.61	3.56	3.50	3.45	3.40	3.34	3.29
70.5	4.19	4.28	4.37	4.46	4.43	4.38	4.33	4.27	4.22	4.16	4.11	4.06	4.00	3.95	3.89	3.84	3.79	3.73	3.68	3.62	3.57	3.52	3.46	3.41	3.35
71.0	4.25	4.34	4.43	4.52	4.50	4.45	4.39	4.34	4.28	4.23	4.18	4.12	4.07	4.01	3.96	3.91	3.85	3.80	3.74	3.69	3.64	3.58	3.53	3.47	3.42
71.5	4.31	4.40	4.49	4.58	4.57	4.51	4.46	4.40	4.35	4.30	4.24	4.19	4.13	4.08	4.03	3.97	3.92	3.86	3.81	3.76	3.70	3.65	3.59	3.54	3.49
72.0	4.37	4.46	4.55	4.64	4.63	4.58	4.52	4.47	4.42	4.36	4.31	4.25	4.20	4.15	4.09	4.04	3.98	3.93	3.88	3.82	3.77	3.71	3.66	3.61	3.55
72.5	4.43	4.52	4.61	4.70	4.70	4.64	4.59	4.54	4.48	4.43	4.37	4.32	4.27	4.21	4.16	4.10	4.05	4.00	3.94	3.89	3.83	3.78	3.73	3.67	3.62
73.0	4.49	4.58	4.67	4.76	4.76	4.71	4.66	4.60	4.55	4.49	4.44	4.39	4.33	4.28	4.22	4.17	4.12	4.06	4.01	3.95	3.90	3.85	3.79	3.74	3.68
73.5	4.54	4.63	4.72	4.81	4.83	4.78	4.72	4.67	4.61	4.56	4.51	4.45	4.40	4.34	4.29	4.24	4.18	4.13	4.07	4.02	3.97	3.91	3.86	3.80	3.75
74.0	4.60	4.69	4.78	4.87	4.90	4.84	4.79	4.73	4.68	4.63	4.57	4.52	4.46	4.41	4.36	4.30	4.25	4.19	4.14	4.09	4.03	3.98	3.92	3.87	3.82
74.5	4.66	4.75	4.84	4.93	4.96	4.91	4.85	4.80	4.75	4.69	4.64	4.58	4.53	4.48	4.42	4.37	4.31	4.26	4.21	4.15	4.10	4.04	3.99	3.94	3.88
75.0	4.72	4.81	4.90	4.99	5.03	4.97	4.92	4.87	4.81	4.76	4.70	4.65	4.60	4.54	4.49	4.43	4.38	4.33	4.27	4.22	4.16	4.11	4.06	4.00	3.95
75.5	4.78	4.87	4.96	5.05	5.09	5.04	4.99	4.93	4.88	4.82	4.77	4.72	4.66	4.61	4.55	4.50	4.45	4.39	4.34	4.28	4.23	4.18	4.12	4.07	4.01
76.0	4.84	4.93	5.02	5.11	5.16	5.11	5.05	5.00	4.94	4.89	4.84	4.78	4.73	4.67	4.62	4.57	4.51	4.46	4.40	4.35	4.30	4.24	4.19	4.13	4.08
76.5	4.90	4.99	5.08	5.17	5.23	5.17	5.12	5.06	5.01	4.96	4.90	4.85	4.79	4.74	4.69	4.63	4.58	4.52	4.47	4.42	4.36	4.31	4.25	4.20	4.15
77.0	4.95	5.04	5.13	5.22	5.29	5.24	5.18	5.13	5.08	5.02	4.97	4.91	4.86	4.81	4.75	4.70	4.64	4.59	4.54	4.48	4.43	4.37	4.32	4.27	4.21
77.5	5.01	5.10	5.19	5.28	5.36	5.30	5.25	5.20	5.14	5.09	5.03	4.98	4.93	4.87	4.82	4.76	4.71	4.66	4.60	4.55	4.49	4.44	4.39	4.33	4.28
78.0	5.07	5.16	5.25	5.34	5.42	5.37	5.32	5.26	5.21	5.15	5.10	5.05	4.99	4.94	4.88	4.83	4.78	4.72	4.67	4.61	4.56	4.51	4.45	4.40	4.34
78.5	5.13	5.22	5.31	5.40	5.49	5.44	5.38	5.33	5.27	5.22	5.17	5.11	5.06	5.00	4.95	4.90	4.84	4.79	4.73	4.68	4.63	4.57	4.52	4.46	4.41
79.0	5.19	5.28	5.37	5.46	5.56	5.50	5.45	5.39	5.34	5.29	5.23	5.18	5.12	5.07	5.02	4.96	4.91	4.85	4.80	4.75	4.69	4.64	4.58	4.53	4.48
79.5	5.25	5.34	5.43	5.52	5.62	5.57	5.51	5.46	5.41	5.35	5.30	5.24	5.19	5.14	5.08	5.03	4.97	4.92	4.87	4.81	4.76	4.70	4.65	4.60	4.54
80.0	5.30	5.39	5.48	5.57	5.69	5.63	5.58	5.53	5.47	5.42	5.36	5.31	5.26	5.20	5.15	5.09	5.04	4.99	4.93	4.88	4.82	4.77	4.72	4.66	4.61
80.5	5.36	5.45	5.54	5.63	5.75	5.70	5.65	5.59	5.54	5.48	5.43	5.38	5.32	5.27	5.21	5.16	5.11	5.05	5.00	4.94	4.89	4.84	4.78	4.73	4.67
81.0	5.42	5.51	5.60	5.69	5.82	5.77	5.71	5.66	5.60	5.55	5.50	5.44	5.39	5.33	5.28	5.23	5.17	5.12	5.06	5.01	4.96	4.90	4.85	4.79	4.74
81.5	5.48	5.57	5.66	5.75	5.89	5.83	5.78	5.72	5.67	5.62	5.56	5.51	5.45	5.40	5.35	5.29	5.24	5.18	5.13	5.08	5.02	4.97	4.91	4.86	4.81
82.0	5.54	5.63	5.72	5.81	5.95	5.90	5.84	5.79	5.74	5.68	5.63	5.57	5.52	5.47	5.41	5.36	5.30	5.25	5.20	5.14	5.09	5.03	4.98	4.93	4.87
82.5	5.60	5.69	5.78	5.87	6.02	5.96	5.91	5.86	5.80	5.75	5.69	5.64	5.59	5.53	5.48	5.42	5.37	5.32	5.26	5.21	5.15	5.10	5.05	4.99	4.94
83.0	5.65	5.74	5.83	5.92	6.08	6.03	5.98	5.92	5.87	5.81	5.76	5.71	5.65	5.60	5.54	5.49	5.44	5.38	5.33	5.27	5.22	5.17	5.11	5.06	5.00
83.5	5.71	5.80	5.89	5.98	6.15	6.10	6.04	5.99	5.93	5.88	5.83	5.77	5.72	5.66	5.61	5.56	5.50	5.45	5.39	5.34	5.29	5.23	5.18	5.12	5.07
84.0	5.77	5.86	5.95	6.04	6.22	6.16	6.11	6.05	6.00	5.95	5.89	5.84	5.78	5.73	5.68	5.62	5.57	5.51	5.46	5.41	5.35	5.30	5.24	5.19	5.14
84.5	5.83	5.92	6.01	6.10	6.28	6.23	6.17	6.12	6.07	6.01	5.96	5.90	5.85	5.80	5.74	5.69	5.63	5.58	5.53	5.47	5.42	5.36	5.31	5.26	5.20
85.0	5.89	5.98	6.07	6.16	6.35	6.29	6.24	6.19	6.13	6.08	6.02	5.97	5												

TABLE 3. PREDICTED FVC FOR FEMALES (HUDSON, ET AL; AM REV RESPIR DIS, 1976, 113, 907.)

HT	AGE																								
	17	19	21	23	25	27	29	31	33	35															
52.0	2.45	2.64	2.65	2.61	2.96	2.92	2.47	2.43	2.39	2.34	2.30	2.25	2.21	2.17	2.12	2.08	2.03	1.99	1.95	1.90	1.86	1.81	1.77	1.73	1.68
52.5	2.50	2.68	2.70	2.65	2.61	2.57	2.32	2.40	2.43	2.39	2.35	2.30	2.26	2.21	2.17	2.13	2.08	2.04	1.99	1.95	1.91	1.86	1.82	1.77	1.73
53.0	2.54	2.72	2.74	2.70	2.66	2.61	2.57	2.52	2.48	2.44	2.39	2.35	2.30	2.26	2.22	2.17	2.13	2.08	2.04	2.00	1.95	1.91	1.86	1.82	1.78
53.5	2.50	2.76	2.79	2.75	2.70	2.66	2.62	2.57	2.53	2.48	2.44	2.40	2.35	2.31	2.26	2.22	2.18	2.13	2.09	2.04	2.00	1.96	1.91	1.87	1.82
54.0	2.62	2.81	2.84	2.79	2.75	2.71	2.66	2.62	2.57	2.53	2.49	2.44	2.40	2.35	2.31	2.27	2.22	2.18	2.13	2.09	2.05	2.00	1.96	1.91	1.87
54.5	2.66	2.85	2.89	2.84	2.80	2.75	2.71	2.67	2.62	2.58	2.53	2.49	2.45	2.40	2.36	2.31	2.27	2.23	2.18	2.14	2.09	2.05	2.01	1.96	1.92
55.0	2.71	2.89	2.93	2.89	2.84	2.80	2.76	2.71	2.67	2.62	2.58	2.54	2.49	2.45	2.40	2.36	2.32	2.27	2.23	2.18	2.14	2.10	2.05	2.01	1.96
55.5	2.75	2.93	2.98	2.94	2.89	2.85	2.80	2.76	2.72	2.67	2.63	2.58	2.54	2.50	2.45	2.41	2.36	2.32	2.28	2.23	2.19	2.14	2.10	2.06	2.01
56.0	2.79	2.97	3.03	2.98	2.94	2.89	2.85	2.81	2.76	2.72	2.67	2.63	2.59	2.54	2.50	2.45	2.41	2.37	2.32	2.28	2.23	2.19	2.15	2.10	2.06
56.5	2.83	3.01	3.07	3.03	2.99	2.94	2.90	2.85	2.81	2.77	2.72	2.68	2.63	2.59	2.55	2.50	2.46	2.41	2.37	2.33	2.28	2.24	2.19	2.15	2.11
57.0	2.87	3.06	3.12	3.08	3.03	2.99	2.94	2.90	2.86	2.81	2.77	2.72	2.68	2.64	2.59	2.55	2.50	2.46	2.42	2.37	2.33	2.28	2.24	2.20	2.15
57.5	2.91	3.10	3.17	3.12	3.08	3.04	2.99	2.95	2.90	2.86	2.82	2.77	2.73	2.68	2.64	2.60	2.55	2.51	2.46	2.42	2.38	2.33	2.29	2.24	2.20
58.0	2.96	3.14	3.21	3.17	3.13	3.08	3.04	2.99	2.95	2.91	2.86	2.82	2.77	2.73	2.69	2.64	2.60	2.55	2.51	2.47	2.42	2.38	2.33	2.29	2.25
58.5	3.00	3.18	3.26	3.22	3.17	3.13	3.09	3.04	3.00	2.95	2.91	2.87	2.82	2.78	2.73	2.69	2.65	2.60	2.56	2.51	2.47	2.42	2.38	2.34	2.29
59.0	3.04	3.22	3.31	3.26	3.22	3.18	3.13	3.09	3.04	3.00	2.96	2.91	2.87	2.82	2.78	2.74	2.69	2.65	2.60	2.56	2.52	2.47	2.43	2.38	2.34
59.5	3.08	3.27	3.36	3.31	3.27	3.22	3.18	3.14	3.09	3.05	3.00	2.96	2.92	2.87	2.83	2.78	2.74	2.70	2.65	2.61	2.56	2.52	2.48	2.43	2.39
60.0	3.12	3.31	3.40	3.36	3.31	3.27	3.23	3.18	3.14	3.09	3.05	3.01	2.96	2.92	2.87	2.83	2.79	2.74	2.70	2.65	2.61	2.57	2.52	2.48	2.43
60.5	3.17	3.35	3.45	3.41	3.36	3.32	3.27	3.23	3.19	3.14	3.10	3.05	3.01	2.97	2.92	2.88	2.83	2.79	2.75	2.70	2.66	2.61	2.57	2.53	2.49
61.0	3.21	3.39	3.50	3.45	3.41	3.36	3.32	3.28	3.23	3.19	3.14	3.10	3.06	3.01	2.97	2.92	2.88	2.84	2.79	2.75	2.70	2.66	2.62	2.57	2.53
61.5	3.25	3.43	3.54	3.50	3.46	3.41	3.37	3.32	3.28	3.24	3.19	3.15	3.10	3.06	3.02	2.97	2.93	2.88	2.84	2.80	2.75	2.71	2.66	2.62	2.58
62.0	3.29	3.48	3.59	3.55	3.50	3.46	3.41	3.37	3.33	3.28	3.24	3.19	3.15	3.11	3.06	3.02	2.97	2.93	2.89	2.84	2.80	2.75	2.71	2.67	2.62
62.5	3.33	3.52	3.64	3.59	3.55	3.51	3.46	3.42	3.37	3.33	3.29	3.24	3.20	3.15	3.11	3.07	3.02	2.98	2.93	2.89	2.85	2.80	2.76	2.71	2.67
63.0	3.38	3.56	3.68	3.64	3.60	3.55	3.51	3.46	3.42	3.38	3.33	3.29	3.24	3.20	3.16	3.11	3.07	3.02	2.98	2.94	2.89	2.85	2.80	2.76	2.72
63.5	3.42	3.60	3.73	3.69	3.64	3.60	3.56	3.51	3.47	3.42	3.38	3.34	3.29	3.25	3.20	3.16	3.12	3.07	3.03	2.98	2.94	2.90	2.85	2.81	2.76
64.0	3.46	3.64	3.78	3.73	3.69	3.65	3.60	3.56	3.51	3.47	3.43	3.38	3.34	3.29	3.25	3.21	3.16	3.12	3.07	3.03	2.99	2.94	2.90	2.85	2.81
64.5	3.50	3.69	3.83	3.78	3.74	3.69	3.65	3.61	3.56	3.52	3.47	3.43	3.39	3.34	3.30	3.25	3.21	3.17	3.12	3.08	3.03	2.99	2.95	2.90	2.86
65.0	3.54	3.73	3.87	3.83	3.78	3.74	3.70	3.65	3.61	3.56	3.52	3.48	3.43	3.39	3.34	3.30	3.26	3.21	3.17	3.12	3.08	3.04	2.99	2.95	2.90
65.5	3.59	3.77	3.92	3.88	3.83	3.79	3.74	3.70	3.66	3.61	3.57	3.52	3.48	3.44	3.39	3.35	3.30	3.26	3.22	3.17	3.13	3.08	3.04	3.00	2.95
66.0	3.63	3.81	3.97	3.92	3.88	3.83	3.79	3.75	3.70	3.66	3.61	3.57	3.53	3.48	3.44	3.39	3.35	3.31	3.26	3.22	3.17	3.13	3.09	3.04	3.00
66.5	3.67	3.85	4.01	3.97	3.93	3.88	3.84	3.79	3.75	3.71	3.66	3.62	3.57	3.53	3.49	3.44	3.40	3.35	3.31	3.27	3.22	3.18	3.13	3.09	3.05
67.0	3.71	3.89	4.06	4.02	3.97	3.93	3.88	3.84	3.80	3.75	3.71	3.66	3.62	3.58	3.53	3.49	3.44	3.40	3.36	3.31	3.27	3.22	3.18	3.14	3.09
67.5	3.75	3.94	4.11	4.06	4.02	3.98	3.93	3.89	3.84	3.80	3.76	3.71	3.67	3.62	3.58	3.54	3.49	3.45	3.40	3.36	3.32	3.27	3.23	3.18	3.14
68.0	3.79	3.98	4.15	4.11	4.07	4.02	3.98	3.93	3.89	3.85	3.80	3.76	3.71	3.67	3.63	3.58	3.54	3.49	3.45	3.41	3.36	3.32	3.27	3.23	3.19
68.5	3.84	4.02	4.20	4.16	4.11	4.07	4.03	3.98	3.94	3.89	3.85	3.81	3.76	3.72	3.67	3.63	3.59	3.54	3.50	3.45	3.41	3.37	3.32	3.28	3.23
69.0	3.88	4.06	4.25	4.20	4.16	4.12	4.07	4.03	3.98	3.94	3.89	3.85	3.81	3.76	3.72	3.68	3.63	3.59	3.54	3.50	3.46	3.41	3.37	3.32	3.28
69.5	3.92	4.10	4.30	4.25	4.21	4.16	4.12	4.08	4.03	3.99	3.94	3.90	3.86	3.81	3.77	3.72	3.68	3.64	3.59	3.55	3.50	3.46	3.42	3.37	3.33
70.0	3.96	4.15	4.34	4.30	4.25	4.21	4.17	4.12	4.08	4.03	3.99	3.95	3.90	3.86	3.81	3.77	3.73	3.68	3.64	3.59	3.55	3.51	3.46	3.42	3.37
70.5	4.00	4.19	4.39	4.35	4.30	4.26	4.21	4.17	4.13	4.08	4.04	4.00	3.95	3.91	3.86	3.82	3.77	3.73	3.69	3.64	3.60	3.55	3.51	3.47	3.42
71.0	4.05	4.23	4.44	4.39	4.35	4.30	4.26	4.22	4.17	4.13	4.08	4.04	4.00	3.95	3.91	3.86	3.82	3.78	3.73	3.69	3.64	3.60	3.56	3.51	3.47
71.5	4.09	4.27	4.48	4.44	4.40	4.35	4.31	4.26	4.22	4.18	4.13	4.09	4.04	4.00	3.96	3.91	3.87	3.82	3.78	3.74	3.69	3.65	3.60	3.56	3.52
72.0	4.13	4.31	4.53	4.49	4.44	4.40	4.35	4.31	4.27	4.22	4.18	4.13	4.09	4.05	4.00	3.96	3.91	3.87	3.83	3.78	3.74	3.69	3.65	3.61	3.56
72.5	4.17	4.36	4.58	4.53	4.49	4.45	4.40	4.36	4.31	4.27	4.23	4.18	4.14	4.09	4.05	4.01	3.96	3.92	3.87	3.83	3.79	3.74	3.70	3.65	3.61
73.0	4.21	4.40	4.62	4.58	4.54	4.49	4.45	4.40	4.36	4.32	4.27	4.23	4.18	4.14	4.10	4.05	4.01	3.96	3.92	3.88	3.83	3.79	3.74	3.70	3.66
73.5	4.26	4.44	4.67	4.63	4.58	4.54	4.50	4.45	4.41	4.36	4.32	4.28	4.23	4.19	4.14	4.10	4.06	4.01	3.97	3.92	3.88	3.84	3.79	3.75	3.70
74.0	4.30	4.48	4.72	4.67	4.63	4.59	4.54	4.50	4.45	4.41	4.37	4.32	4.28	4.23	4.19	4.15	4.10	4.06	4.01	3.97	3.93	3.88	3.84	3.79	3.75
74.5	4.34	4.52	4.77	4.72	4.68	4.63	4.59	4.55	4.50	4.46	4.41	4.37	4.33	4.28	4.24	4.19	4.15	4.11	4.06	4.02	3.97	3.93	3.89	3.84	3.80
75.0	4.38	4.57	4.81	4.77	4.72	4.68	4.64	4.59	4.55	4.50	4.46	4.42	4.37	4.33	4.28	4.24	4.20	4.15	4.11	4.06	4.02	3.98	3.93	3.89	3.84
75.5	4.42	4.61	4.86	4.82	4.77	4.73	4.68	4.64	4.60	4.55	4.51	4.46	4.42	4.38	4.33	4.29	4.24	4.20	4.16	4.11	4.07	4.02	3.98	3.94	3.89
76.0	4.47	4.65	4.91	4.86	4.82	4.77	4.73	4.69	4.64	4.60	4.55	4.51	4.47	4.42	4.38	4.33	4.29	4.25	4.20	4.16	4.11	4.07	4.03	3.99	3.94
76.5	4.51	4.69	4.95	4.91	4.87	4.82	4.78	4.73	4.69	4.65	4.60	4.56	4.51	4.47	4.43	4.38	4.34	4.29	4.25	4.21	4.16	4.12	4.07	4.03	3.99
77.0	4.55	4.73	5.00	4.96	4.91	4.87	4.82	4.78	4.74	4.69	4.65	4.60	4.56	4.52</											

TABLE 4. PREDICTED FEV1 FOR FEMALES (HUDSON, ET AL; AM REV RESPIR DIS, 1976, 113, 587.)

HT	AGE																								
	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65
52.0	2.31	2.40	2.33	2.29	2.25	2.21	2.16	2.12	2.08	2.04	2.00	1.95	1.91	1.87	1.83	1.79	1.74	1.70	1.66	1.62	1.58	1.53	1.49	1.45	1.41
52.5	2.34	2.51	2.37	2.32	2.28	2.24	2.20	2.16	2.11	2.07	2.03	1.99	1.95	1.90	1.86	1.82	1.78	1.74	1.69	1.65	1.61	1.57	1.53	1.48	1.44
53.0	2.38	2.55	2.40	2.36	2.32	2.27	2.23	2.19	2.15	2.11	2.06	2.02	1.98	1.94	1.90	1.85	1.81	1.77	1.73	1.69	1.64	1.60	1.56	1.52	1.48
53.5	2.41	2.58	2.43	2.39	2.35	2.31	2.27	2.22	2.18	2.14	2.10	2.06	2.01	1.97	1.93	1.89	1.85	1.80	1.76	1.72	1.68	1.64	1.59	1.55	1.51
54.0	2.45	2.62	2.47	2.43	2.39	2.34	2.30	2.26	2.22	2.17	2.13	2.09	2.05	2.01	1.96	1.92	1.88	1.84	1.80	1.75	1.71	1.67	1.63	1.59	1.54
54.5	2.48	2.65	2.50	2.46	2.42	2.38	2.33	2.29	2.25	2.21	2.17	2.12	2.08	2.04	2.00	1.96	1.91	1.87	1.83	1.79	1.75	1.70	1.66	1.62	1.58
55.0	2.51	2.68	2.54	2.49	2.45	2.41	2.37	2.33	2.28	2.24	2.20	2.16	2.12	2.07	2.03	1.99	1.95	1.91	1.86	1.82	1.78	1.74	1.70	1.65	1.61
55.5	2.55	2.72	2.57	2.53	2.49	2.45	2.40	2.36	2.32	2.28	2.24	2.19	2.15	2.11	2.07	2.03	1.98	1.94	1.90	1.86	1.82	1.77	1.73	1.69	1.65
56.0	2.58	2.75	2.61	2.56	2.52	2.48	2.44	2.40	2.35	2.31	2.27	2.23	2.19	2.14	2.10	2.06	2.02	1.98	1.93	1.89	1.85	1.81	1.77	1.72	1.68
56.5	2.62	2.79	2.64	2.60	2.56	2.51	2.47	2.43	2.39	2.35	2.30	2.26	2.22	2.18	2.14	2.09	2.05	2.01	1.97	1.93	1.88	1.84	1.80	1.76	1.72
57.0	2.65	2.82	2.67	2.63	2.59	2.55	2.51	2.46	2.42	2.38	2.34	2.30	2.25	2.21	2.17	2.13	2.09	2.04	2.00	1.96	1.92	1.88	1.83	1.79	1.75
57.5	2.69	2.86	2.71	2.67	2.62	2.58	2.54	2.50	2.46	2.41	2.37	2.33	2.29	2.25	2.20	2.16	2.12	2.08	2.04	1.99	1.95	1.91	1.87	1.83	1.78
58.0	2.72	2.89	2.74	2.70	2.66	2.62	2.57	2.53	2.49	2.45	2.41	2.36	2.32	2.28	2.24	2.20	2.15	2.11	2.07	2.03	1.99	1.94	1.90	1.86	1.82
58.5	2.75	2.92	2.77	2.73	2.69	2.65	2.61	2.57	2.52	2.48	2.44	2.40	2.36	2.31	2.27	2.23	2.19	2.15	2.10	2.06	2.02	1.98	1.94	1.89	1.85
59.0	2.79	2.96	2.81	2.77	2.73	2.69	2.64	2.60	2.56	2.52	2.48	2.43	2.39	2.35	2.31	2.27	2.22	2.18	2.14	2.10	2.06	2.01	1.97	1.93	1.89
59.5	2.82	2.99	2.85	2.80	2.76	2.72	2.68	2.64	2.59	2.55	2.51	2.47	2.43	2.38	2.34	2.30	2.26	2.22	2.17	2.13	2.09	2.05	2.01	1.96	1.92
60.0	2.86	3.03	2.88	2.84	2.80	2.76	2.71	2.67	2.63	2.59	2.54	2.50	2.46	2.42	2.38	2.33	2.29	2.25	2.21	2.17	2.12	2.08	2.04	2.00	1.96
60.5	2.89	3.06	2.91	2.87	2.83	2.79	2.75	2.70	2.66	2.62	2.58	2.54	2.49	2.45	2.41	2.37	2.33	2.28	2.24	2.20	2.16	2.12	2.07	2.03	1.99
61.0	2.93	3.10	2.95	2.91	2.86	2.82	2.78	2.74	2.70	2.65	2.61	2.57	2.53	2.49	2.44	2.40	2.36	2.32	2.28	2.23	2.19	2.15	2.11	2.07	2.02
61.5	2.96	3.13	2.98	2.94	2.90	2.86	2.81	2.77	2.73	2.69	2.65	2.60	2.56	2.52	2.48	2.44	2.39	2.35	2.31	2.27	2.23	2.18	2.14	2.10	2.06
62.0	2.99	3.16	3.02	2.97	2.93	2.89	2.85	2.81	2.76	2.72	2.68	2.64	2.60	2.55	2.51	2.47	2.43	2.39	2.34	2.30	2.26	2.22	2.18	2.13	2.09
62.5	3.03	3.20	3.05	3.01	2.97	2.93	2.88	2.84	2.80	2.75	2.72	2.67	2.63	2.59	2.55	2.51	2.46	2.42	2.38	2.34	2.30	2.25	2.21	2.17	2.13
63.0	3.06	3.23	3.09	3.04	3.00	2.96	2.92	2.88	2.83	2.79	2.75	2.71	2.67	2.62	2.58	2.54	2.50	2.46	2.41	2.37	2.33	2.29	2.25	2.20	2.16
63.5	3.10	3.27	3.12	3.08	3.04	2.99	2.95	2.91	2.87	2.83	2.78	2.74	2.70	2.66	2.62	2.57	2.53	2.49	2.45	2.41	2.36	2.32	2.28	2.24	2.20
64.0	3.13	3.30	3.15	3.11	3.07	3.03	2.99	2.94	2.90	2.86	2.82	2.78	2.73	2.69	2.65	2.61	2.57	2.52	2.48	2.44	2.40	2.36	2.31	2.27	2.23
64.5	3.17	3.34	3.19	3.15	3.10	3.06	3.02	2.98	2.94	2.89	2.85	2.81	2.77	2.73	2.68	2.64	2.60	2.56	2.52	2.47	2.43	2.39	2.35	2.31	2.26
65.0	3.20	3.37	3.22	3.18	3.14	3.10	3.05	3.01	2.97	2.93	2.89	2.84	2.80	2.76	2.72	2.68	2.63	2.59	2.55	2.51	2.47	2.42	2.38	2.34	2.30
65.5	3.23	3.40	3.26	3.21	3.17	3.13	3.09	3.05	3.00	2.96	2.92	2.88	2.84	2.79	2.75	2.71	2.67	2.63	2.58	2.54	2.50	2.46	2.42	2.37	2.33
66.0	3.27	3.44	3.29	3.25	3.21	3.17	3.12	3.08	3.04	3.00	2.95	2.91	2.87	2.83	2.79	2.75	2.70	2.66	2.62	2.58	2.54	2.49	2.45	2.41	2.37
66.5	3.30	3.47	3.33	3.28	3.24	3.20	3.16	3.12	3.07	3.03	2.99	2.95	2.91	2.86	2.82	2.78	2.74	2.70	2.65	2.61	2.57	2.53	2.49	2.44	2.40
67.0	3.34	3.51	3.36	3.32	3.28	3.23	3.19	3.15	3.11	3.07	3.02	2.98	2.94	2.90	2.86	2.81	2.77	2.73	2.69	2.63	2.60	2.56	2.52	2.48	2.44
67.5	3.37	3.54	3.39	3.35	3.31	3.27	3.23	3.18	3.14	3.10	3.06	3.02	2.97	2.93	2.89	2.85	2.81	2.76	2.72	2.68	2.64	2.60	2.55	2.51	2.47
68.0	3.41	3.58	3.43	3.39	3.34	3.30	3.26	3.22	3.18	3.13	3.09	3.05	3.01	2.97	2.92	2.88	2.84	2.80	2.76	2.71	2.67	2.63	2.59	2.55	2.50
68.5	3.44	3.61	3.46	3.42	3.38	3.34	3.29	3.25	3.21	3.17	3.13	3.08	3.04	3.00	2.96	2.92	2.87	2.83	2.79	2.75	2.71	2.66	2.62	2.58	2.54
69.0	3.47	3.64	3.50	3.46	3.41	3.37	3.33	3.29	3.25	3.20	3.16	3.12	3.08	3.04	2.99	2.95	2.91	2.87	2.83	2.78	2.74	2.70	2.66	2.62	2.57
69.5	3.51	3.68	3.53	3.49	3.45	3.41	3.36	3.32	3.28	3.24	3.20	3.15	3.11	3.07	3.03	2.99	2.94	2.90	2.86	2.82	2.78	2.73	2.69	2.65	2.61
70.0	3.54	3.71	3.57	3.52	3.48	3.44	3.40	3.36	3.31	3.27	3.23	3.19	3.15	3.10	3.06	3.02	2.98	2.94	2.89	2.85	2.81	2.77	2.73	2.68	2.64
70.5	3.58	3.75	3.60	3.56	3.52	3.47	3.43	3.39	3.35	3.31	3.26	3.22	3.18	3.14	3.10	3.05	3.01	2.97	2.93	2.89	2.84	2.80	2.76	2.72	2.68
71.0	3.61	3.78	3.63	3.59	3.55	3.51	3.47	3.42	3.38	3.34	3.30	3.26	3.21	3.17	3.13	3.09	3.05	3.00	2.96	2.92	2.88	2.84	2.79	2.75	2.71
71.5	3.65	3.82	3.67	3.63	3.59	3.54	3.50	3.46	3.42	3.37	3.33	3.29	3.25	3.21	3.16	3.12	3.08	3.04	3.00	2.95	2.91	2.87	2.83	2.79	2.74
72.0	3.66	3.83	3.70	3.66	3.62	3.58	3.53	3.49	3.45	3.41	3.37	3.32	3.28	3.24	3.20	3.16	3.11	3.07	3.03	2.99	2.95	2.90	2.86	2.82	2.78
72.5	3.71	3.88	3.74	3.70	3.65	3.61	3.57	3.53	3.49	3.44	3.40	3.36	3.32	3.28	3.23	3.19	3.15	3.11	3.07	3.02	2.98	2.94	2.90	2.86	2.81
73.0	3.75	3.92	3.77	3.73	3.69	3.65	3.60	3.56	3.52	3.48	3.44	3.39	3.35	3.31	3.27	3.23	3.18	3.14	3.10	3.06	3.02	2.97	2.93	2.89	2.85
73.5	3.78	3.95	3.81	3.76	3.72	3.68	3.64	3.60	3.55	3.51	3.47	3.43	3.39	3.34	3.30	3.26	3.22	3.18	3.13	3.09	3.05	3.01	2.97	2.92	2.88
74.0	3.82	3.99	3.84	3.80	3.76	3.71	3.67	3.63	3.59	3.55	3.50	3.46	3.42	3.38	3.34	3.29	3.25	3.21	3.17	3.13	3.08	3.04	3.00	2.96	2.92
74.5	3.85	4.02	3.87	3.83	3.79	3.75	3.71	3.66	3.62	3.58	3.54	3.50	3.45	3.41	3.37	3.33	3.29	3.24	3.20	3.16	3.12	3.08	3.03	2.99	2.95
75.0	3.89	4.06	3.91	3.87	3.82	3.78	3.74	3.70	3.66	3.61	3.57	3.53	3.49	3.45	3.40	3.36	3.32	3.28	3.24	3.19	3.15	3.11	3.07	3.03	2.98
75.5	3.92	4.09	3.94	3.90	3.86	3.82	3.77	3.73	3.69	3.65	3.61	3.56	3.52	3.48	3.44	3.40	3.35	3.31	3.27	3.23	3.19	3.14	3.10	3.06	3.02
76.0	3.95	4.12	3.98	3.94	3.89	3.85	3.81	3.77	3.73	3.68	3.64	3.60	3.56	3.52	3.47	3.43	3.39	3.35	3.31	3.26	3.22	3.18	3.14	3.10	3.05
76.5	3.99	4.16	4.01	3.97	3.93	3.89	3.84	3.80	3.76	3.72	3.68	3.63	3.59	3.55	3.51	3.47	3.42	3.38	3.34	3.30	3.26	3.21	3.17	3.13	3.09
77.0	4.02	4.19	4.05																						

(j) The instrument must be capable of being calibrated in the field with respect to the FEV₁ and FVC. This calibration of the FEV₁ and FVC may be either directly or indirectly through volume and time base measurements. The volume calibration source should provide a volume displacement of at least 2 liters and should be accurate to within ± 30 milliliters.

(2) Technique for measurement of forced vital capacity maneuver.

(a) Use of a nose clip is recommended but not required. The procedures shall be explained in simple terms to the patient who shall be instructed to loosen any tight clothing and stand in front of the apparatus. The subject may sit, but care should be taken on repeat testing that same position be used and, if possible, the same spirometer. Particular attention shall be given to insure that the chin is slightly elevated with the neck slightly extended. The patient shall be instructed to make a full inspiration from a normal breathing pattern and then blow into the apparatus, without interruption, as hard, fast, and completely as possible. At least three forced expirations shall be carried out. During the maneuvers, the patient shall be observed for compliance with instructions. The expirations shall be checked visually for reproducibility from flow-volume or volume-time tracings or displays. The following efforts shall be judged unacceptable when the patient:

- (i) Has not reached full inspiration preceding the forced expiration,
- (ii) Has not used maximal effort during the entire forced expiration,
- (iii) Has not continued the expiration for at least 5 seconds or until an obvious plateau in the volume time curve has occurred,
- (iv) Has coughed or closed his glottis,
- (v) Has an obstructed mouthpiece or a leak around the mouthpiece (obstruction due to tongue being placed in front of mouthpiece, false teeth falling in front of mouthpiece, etc.),
- (vi) Has an unsatisfactory start of expiration, one characterized by excessive hesitation (or false starts), and therefore not allowing back extrapolation of time 0 (extrapolated volume on the volume time tracing must be less than 10 percent of the FVC),

(vii) Has an excessive variability between the three acceptable curves. The variation between the two largest FVC's and FEV₁'s of the three satisfactory tracings should not exceed 10 percent or ± 100 milliliters, whichever is greater.

(b) Periodic and routine recalibration of the instrument or method for recording FVC and FEV_{1.0} should be performed using a syringe or other volume source of at least 2 liters.

(3) Interpretation of spirogram.

(a) The first step in evaluating a spirogram should be to determine whether or not the patient has performed the test properly or as described in subsection (2) of this section. From the three satisfactory tracings, the forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV_{1.0}) shall be measured and recorded. The largest observed FVC

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and largest observed FEV_{1.0} shall be used in the analysis regardless of the curve(s) on which they occur.

(b) The following guidelines are recommended by NIOSH for the evaluation and management of workers exposed to cotton dust. It is important to note that employees who show reductions in FEV₁/FVC ratio below .75 or drops in Monday FEV₁ of 5 percent or greater on their initial screening exam, should be reevaluated within a month of the first exam. Those who show consistent decrease in lung function, as shown on the following table, should be managed as recommended.

(4) Qualifications of personnel administering the test.

Technicians who perform pulmonary function testing should have the basic knowledge required to produce meaningful results. Training consisting of approximately 16 hours of formal instruction should cover the following areas.

(a) Basic physiology of the forced vital capacity maneuver and the determinants of airflow limitation with emphasis on the relation to reproducibility of results.

(b) Instrumentation requirements including calibration procedures, sources of error and their correction.

(c) Performance of the testing including subject coaching, recognition of improperly performed maneuvers and corrective actions.

(d) Data quality with emphasis on reproducibility.

(e) Actual use of the equipment under supervised conditions.

(f) Measurement of tracings and calculations of results.

[Statutory Authority: Chapter 49.17 RCW. 88-14-108 (Order 88-11), § 296-62-14541, filed 7/6/88; 87-24-051 (Order 87-24), § 296-62-14541, filed 11/30/87.]

WAC 296-62-14543 Appendix E—Vertical elutriator equivalency protocol.

(a) Samples to be taken—In order to ascertain equivalency, it is necessary to collect a total of 100 samples from at least 10 sites in a mill. That is, there should be 10 replicate readings at each of 10 sites. The sites should represent dust levels which vary over the allowable range of 0.5 to 2 times the permissible exposure limit. Each sample requires the use of two vertical elutriators (VE's) and at least one but not more than two alternative devices (AD's). Thus, the end result is 200 VE readings and either 100 or 200 AD readings. The 2 VE readings and the 1 or 2 AD readings at each time and site must be made simultaneously. That is, the two VE's and one or two AD's must be arranged together in such a way that they are measuring essentially the same dust levels.

(b) Data averaging—The two VE readings taken at each site are then averaged. These averages are to be used as the 100 VE readings. If two alternate devices were used, their test results are also averaged. Thus, after this step is accomplished, there will be 100 VE readings and 100 AD readings.

(c) Differences—For each of the 100 sets of measurements (VE and AD) the difference is obtained as the average VE reading minus the AD reading. Call these differences D_i. Thus, we have.

$$D_i = VE_i - AD_i, i = 1, 2, \dots, 100 \quad (1)$$

Next we compute the arithmetic mean and standard deviations of the differences, using equations (2) and (3), respectively.

$$\bar{X}_D = \frac{1}{N} \sum_{i=1}^N D_i \quad (2)$$

$$S_D = \sqrt{\frac{\sum D_i^2 - \frac{(\sum D_i)^2}{N}}{N-1}} \quad (3)$$

where N equals the number of differences (100 in this case), \bar{X}_D is the arithmetic mean and S_D is the standard deviation.

We next calculate the critical value as $T = K S_D + |\bar{X}_D|$ where $K = 1.87$, based on 100 samples.

(d) Equivalency test. The next step is to obtain the average of the 100 VE readings. This is obtained by equation (4)

$$\bar{X}_{VE} = \frac{1}{N} \left(\sum_{i=1}^N VE_i \right) \quad (4)$$

We next multiply 0.25 by \bar{X}_{VE} . If $T < 0.25 \bar{X}_{VE}$, we can say that the alternate device has passed the equivalency test.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-14543, filed 7/25/86.]

PART O—COKE OVENS

WAC 296-62-200 Coke oven emissions. Scope and application. This section applies to the control of employee exposure to coke oven emissions.

[Order 77-14, § 296-62-200, filed 7/25/77.]

WAC 296-62-20001 Definitions. For the purpose of this section:

(1) "Authorized person." Any person specifically authorized by the employer whose duties require the person to enter a regulated area, or any person entering such an area as a designated representative of employees for the purpose of exercising the opportunity to observe monitoring and measuring procedures under WAC 296-62-20025.

(2) "Beehive oven." A coke oven in which the products of carbonization other than coke are not recovered, but are released into the ambient air.

(3) "Coke oven." A retort in which coke is produced by the destructive distillation or carbonization of coal.

(4) "Coke oven battery." A structure containing a number of slot-type coke ovens.

(5) "Coke oven emissions." The benzenesoluble fraction of total particulate matter present during the destructive distillation or carbonization of coal for the production of coke.

(6) "Director." The director of the department of labor and industries or his or her authorized representative.

(7) "Emergency." Any occurrence such as, but not limited to, equipment failure which is likely to, or does, result in any massive release of coke oven emissions.

[Title 296 WAC—p. 1810]

(8) "Existing coke oven battery." A battery in operation or under construction on January 20, 1977, and which is not rehabilitated.

(9) "Rehabilitated coke oven battery." A battery which is rebuilt, overhauled, renovated, or restored such as from the pad up, after January 20, 1977.

(10) "Stage charging." A procedure by which a predetermined volume of coal in each larry car hopper is introduced into an oven such that no more than two hoppers are discharging simultaneously.

(11) "Sequential charging." A procedure, usually automatically timed, by which a predetermined volume of coal in each larry car hopper is introduced into an oven such that no more than two hoppers commence or finish discharging simultaneously although, at some point, all hoppers are discharging simultaneously.

(12) "Pipeline charging." Any apparatus used to introduce coal into an oven which uses a pipe or duct permanently mounted onto an oven and through which coal is charged.

(13) "Green push." Coke which when removed from the oven results in emissions due to the presence of unvolatized coal.

[Order 77-14, § 296-62-20001, filed 7/25/77.]

WAC 296-62-20003 Permissible exposure limit. The employer shall assure that no employee is exposed to coke oven emissions at concentrations greater than 150 micrograms per cubic meter of air (150 ug/m³), averaged over any 8-hour period.

[Order 77-14, § 296-62-20003, filed 7/25/77.]

WAC 296-62-20005 Regulated areas. (1) The employer shall establish regulated areas and shall limit access to them to authorized persons.

(2) The employer shall establish the following as regulated areas:

(a) The coke oven battery including topside and its machinery, pushside and its machinery, coke side and its machinery, and the battery ends; the wharf; and the screening station;

(b) The beehive oven and its machinery.

[Order 77-14, § 296-62-20005, filed 7/25/77.]

WAC 296-62-20007 Exposure monitoring and measurement. (1) Monitoring program.

(a) Each employer who has a place of employment where coke oven emissions are present shall monitor employees employed in the regulated area to measure their exposure to coke oven emissions.

(b) The employer shall obtain measurements which are representative of each employee's exposure to coke oven emissions over an eight-hour period. All measurements shall determine exposure without regard to the use of respiratory protection.

(c) The employer shall collect full-shift (for at least seven continuous hours) personal samples, including at least one sample during each shift for each battery and each job classification within the regulated areas including at least the following job classifications:

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- (i) Lidman;
- (ii) Tar chaser;
- (iii) Larry car operator;
- (iv) Luterman;
- (v) Machine operator, coke side;
- (vi) Benchman, coke side;
- (vii) Benchman, pusher side;
- (viii) Heater;
- (ix) Quenching car operator;
- (x) Pusher machine operator;
- (xi) Screening station operator;
- (xii) Wharfman;
- (xiii) Oven patcher;
- (xiv) Oven repairman;
- (xv) Spellman; and
- (xvi) Maintenance personnel.

(d) The employer shall repeat the monitoring and measurements required by subsection (1) of this section at least every three months.

(2) Redetermination. Whenever there has been a production, process, or control change which may result in new or additional exposure to coke oven emissions, or whenever the employer has any other reason to suspect an increase in employee exposure, the employer shall repeat the monitoring and measurements required by subsection (1) of this section for those employees affected by such change or increase.

(3) Employee notification.

(a) The employer shall notify each employee in writing of the exposure measurements which represent that employee's exposure within five working days after the receipt of the results of measurements required by subsection (1) and (2) of this section.

(b) Whenever such results indicate that the representative employee exposure exceeds the permissible exposure limit, the employer shall, in such notification, inform each employee of that fact and of the corrective action being taken to reduce exposure to or below the permissible exposure limit.

(4) Accuracy of measurement. The employer shall use a method of monitoring and measurement which has an accuracy (with a confidence level of 95%) of not less than plus or minus 35% for concentrations of coke oven emissions greater than or equal to 150 $\mu\text{g}/\text{m}^3$.

[Order 77-14, § 296-62-20007, filed 7/25/77.]

WAC 296-62-20009 Methods of compliance. The employer shall control employee exposure to coke oven emissions by the use of engineer controls, work practices and respiratory protection as follows:

(1) Priority of compliance methods.

(a) Existing coke oven batteries.

(i) The employer shall institute the engineer and work practice controls listed in subsections (2), (3) and (4) of this section in existing coke oven batteries at the earliest possible time, but not later than January 20, 1980, except to the extent that the employer can establish that such controls are not feasible. In determining the earliest possible time for institution of engineer and work practice controls, the requirement, effective August 27, 1971, to implement feasible administrative or engineer controls to reduce exposures to coal tar pitch

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volatiles, shall be considered. Wherever the engineer and work practice controls which can be instituted are not sufficient to reduce employee exposures to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest level achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of WAC 296-62-20011.

(ii) The engineer and work practice controls required under subsections (2), (3) and (4) of this section are minimum requirements generally applicable to all existing coke oven batteries. If, after implementing all controls required by subsections (2), (3) and (4) of this section, or after January 20, 1980, whichever is sooner, employee exposures still exceed the permissible exposure limit, employers shall implement any other engineer and work practice controls necessary to reduce exposure to or below the permissible exposure limit except to the extent that the employer can establish that such controls are not feasible. Whenever the engineer and work practice controls which can be instituted are not sufficient to reduce employee exposures to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest level achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of WAC 296-62-20011.

(b) New or rehabilitated coke oven batteries.

(i) The employer shall institute the best available engineer and work practice controls on all new or rehabilitated coke oven batteries to reduce and maintain employee exposures at or below the permissible exposure limit, except to the extent that the employer can establish that such controls are not feasible. Wherever the engineer and work practice controls which can be instituted are not sufficient to reduce employee exposures to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest level achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of WAC 296-62-20011.

(ii) If, after implementing all the engineer and work practice controls required by (b)(i) of this subsection, employee exposures still exceed the permissible exposure limit, the employer shall implement any other engineer and work practice controls necessary to reduce exposure to or below the permissible exposure limit except to the extent that the employer can establish that such controls are not feasible. Wherever the engineer and work practice controls which can be instituted are not sufficient to reduce employee exposures to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest level achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of WAC 296-62-20011.

(c) Beehive ovens.

(i) The employer shall institute engineer and work practice controls on all beehive ovens at the earliest possible time to reduce and maintain employee exposures at or below the permissible exposure limit, except to the extent that the employer can establish that such controls are not feasible. In

determining the earliest possible time for institution of engineer and work practice controls, the requirement, effective August 27, 1971, to implement feasible administrative or engineer controls to reduce exposures to coal tar pitch volatiles, shall be considered. Wherever the engineer and work practice controls which can be instituted are not sufficient to reduce employee exposures to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest level achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of WAC 296-62-20011.

(ii) If, after implementing all engineer and work practice controls required by (c)(i) of this subsection, employee exposures still exceed the permissible exposure limit, the employer shall implement any other engineer and work practice controls necessary to reduce exposures to or below the permissible exposure limit except to the extent that the employer can establish that such controls are not feasible. Whenever the engineer and work practice controls which can be instituted are not sufficient to reduce employee exposures to or below the permissible exposure limit, the employer shall nonetheless use them to reduce exposures to the lowest level achievable by these controls and shall supplement them by the use of respiratory protection which complies with the requirements of WAC 296-62-20011.

(2) Engineer controls.

(a) Charging. The employer shall equip and operate existing coke oven batteries with all of the following engineer controls to control coke oven emissions during charging operations:

(i) One of the following methods of charging:

(A) Stage charging as described in subsection (3)(a)(ii) of this section; or

(B) Sequential charging as described in subsection (3)(a)(ii) of this section except that subsection (3)(a)(ii) and (3)(d) of this section does not apply to sequential charging; or

(C) Pipeline charging or other forms of enclosed charging in accordance with (a) of this subsection, except (a)(ii), (iv), (v), (vi) and (viii) of this subsection do not apply.

(ii) Drafting from two or more points in the oven being charged, through the use of double collector mains, or a fixed or moveable jumper pipe system to another oven, to effectively remove the gases from the oven to the collector mains;

(iii) Aspiration systems designed and operated to provide sufficient negative pressure and flow volume to effectively move the gases evolved during charging into the collector mains, including sufficient steam pressure, and steam jets of sufficient diameter;

(iv) Mechanical volumetric controls on each larry car hopper to provide the proper amount of coal to be charged through each charging hole so that the tunnel head will be sufficient to permit the gases to move from the oven into the collector mains;

(v) Devices to facilitate the rapid and continuous flow of coal into the oven being charged, such as stainless steel liners, coal vibrators or pneumatic shells;

(vi) Individually operated larry car drop sleeves and slide gates designed and maintained so that the gases are effectively removed from the oven into the collector mains;

(vii) Mechanized gooseneck and standpipe cleaners;

(viii) Air seals on the pusher machine leveler bars to control air infiltration during charging; and

(ix) Roof carbon cutters or a compressed air system or both on the pusher machine rams to remove roof carbon.

(b) Coking. The employer shall equip and operate existing coke oven batteries with all of the following engineer controls to control coke oven emissions during coking operations:

(i) A pressure control system on each battery to obtain uniform collector main pressure;

(ii) Ready access to door repair facilities capable of prompt and efficient repair of doors, door sealing edges and all door parts;

(iii) An adequate number of spare doors available for replacement purposes;

(iv) Chuck door gaskets to control chuck door emissions until such door is repaired, or replaced; and

(v) Heat shields on door machines.

(3) Work practice controls.

(a) Charging. The employer shall operate existing coke oven batteries with all of the following work practices to control coke oven emissions during the charging operation:

(i) Establishment and implementation of a detailed, written inspection and cleaning procedure for each battery consisting of at least the following elements:

(A) Prompt and effective repair or replacement of all engineer controls;

(B) Inspection and cleaning of goosenecks and standpipes prior to each charge to a specified minimum diameter sufficient to effectively move the evolved gases from the oven to the collector mains;

(C) Inspection for roof carbon build-up prior to each charge and removal of roof carbon as necessary to provide an adequate gas channel so that the gases are effectively moved from the oven into the collector mains;

(D) Inspection of the steam aspiration system prior to each charge so that sufficient pressure and volume is maintained to effectively move the gases from the oven to the collector mains;

(E) Inspection of steam nozzles and liquor sprays prior to each charge and cleaning as necessary so that the steam nozzles and liquor sprays are clean;

(F) Inspection of standpipe caps prior to each charge and cleaning and luting or both as necessary so that the gases are effectively moved from the oven to the collector mains; and

(G) Inspection of charging holes and lids for cracks, warpage and other defects prior to each charge and removal of carbon to prevent emissions, and application of luting material to standpipe and charging hole lids where necessary to obtain a proper seal.

(ii) Establishment and implementation of a detailed written charging procedure, designed and operated to eliminate emissions during charging for each battery, consisting of at least the following elements:

(A) Larry car hoppers filled with coal to a predetermined level in accordance with the mechanical volumetric controls required under subsection (2)(a)(iv) of this section so as to maintain a sufficient gas passage in the oven to be charged;

(B) The larry car aligned over the oven to be charged, so that the drop sleeves fit tightly over the charging holes; and

(C) The oven charged in accordance with the following sequence of requirements:

(I) The aspiration system turned on;

(II) Coal charged through the outermost hoppers, either individually or together, depending on the capacity of the aspiration system to collect the gases involved;

(III) The charging holes used under (a)(ii) and (b) of this subsection relidged or otherwise sealed off to prevent leakage of coke oven emissions;

(IV) If four hoppers are used, the third hopper discharged and relidged or otherwise sealed off to prevent leakage of coke oven emissions;

(V) The final hopper discharged until the gas channel at the top of the oven is blocked and then the chuck door opened and the coal leveled;

(VI) When the coal from the final hopper is discharged and the leveling operation complete, the charging hole relidged or otherwise sealed off to prevent leakage of coke oven emissions; and

(VII) The aspiration system turned off only after the charging holes have been closed.

(VIII) Establishment and implementation of a detailed written charging procedure, designed and operated to eliminate emissions during charging of each pipeline or enclosed charged battery.

(b) Coking. The employer shall operate existing coke oven batteries pursuant to a detailed written procedure established and implemented for the control of coke oven emissions during coking, consisting of at least the following elements:

(i) Checking oven back pressure controls to maintain uniform pressure conditions in the collecting main;

(ii) Repair, replacement and adjustment of oven doors and check doors and replacement of door jams so as to provide a continuous metal-to-metal fit;

(iii) Cleaning of oven doors, chuck doors and door jams each coking cycle so as to provide an effective seal;

(iv) An inspection system and corrective action program to control door emissions to the maximum extent possible; and

(v) Luting of doors that are sealed by luting each coking cycle and reluting, replacing or adjusting as necessary to control leakage.

(c) Pushing. The employer shall operate existing coke oven batteries with the following work practices to control coke oven emissions during pushing operations:

(i) Coke and coal spillage quenched as soon as practicable and not shoveled into a heated oven; and

(ii) A detailed written procedure for each battery established and implemented for the control of emissions during pushing consisting of the following elements:

(A) Dampering off the ovens and removal of charging hole lids to effectively control coke oven emissions during the push;

(B) Heating of the coal charge uniformly for a sufficient period so as to obtain proper coking including preventing green pushes;

(C) Prevention of green pushes to the maximum extent possible;

(D) Inspection, adjustment and correction of heating flue temperatures and defective flues at least weekly and after any green push, so as to prevent green pushes;

(E) Cleaning of heating flues and related equipment to prevent green pushes, at least weekly and after any green push.

(d) Maintenance and repair. The employer shall operate existing coke oven batteries pursuant to a detailed written procedure of maintenance and repair established and implemented for the effective control of coke oven emissions consisting of the following elements:

(i) Regular inspection of all controls, including goose-necks, standpipes, standpipe caps, charging hole lids and castings, jumper pipes and air seals for cracks, misalignment or other defects and prompt implementation of the necessary repairs as soon as possible;

(ii) Maintaining the regulated area in a neat, orderly condition free of coal and coke spillage and debris;

(iii) Regular inspection of the damper system, aspiration system and collector main for cracks or leakage, and prompt implementation of the necessary repairs;

(iv) Regular inspection of the heating system and prompt implementation of the necessary repairs;

(v) Prevention of miscellaneous fugitive topside emissions;

(vi) Regular inspection and patching of over brickwork;

(vii) Maintenance of battery equipment and controls in good working order;

(viii) Maintenance and repair of coke oven doors, chuck doors, door jams and seals; and

(ix) Repairs instituted and completed as soon as possible, including temporary repair measures instituted and completed where necessary, including but not limited to:

(A) Prevention of miscellaneous fugitive topside emissions; and

(B) Chuck door gaskets, which shall be installed prior to the start of the next coking cycle.

(4) Filtered air.

(a) The employer shall provide positive-pressure, temperature controlled filtered air for larry car, pusher machine, door machine, and quench car cabs.

(b) The employer shall provide standby pulpits on the battery topside, at the wharf, and at the screening station, equipped with positive-pressure, temperature controlled filtered air.

(5) Emergencies. Whenever an emergency occurs, the next coking cycle may not begin until the cause of the emergency is determined and corrected, unless the employer can establish that it is necessary to initiate the next coking cycle in order to determine the cause of the emergency.

(6) Compliance program.

(a) Each employer shall establish and implement a written program to reduce exposures solely by means of the engineer and work practice controls specified in subsections (2) through (4) of this section.

(b) The written program shall include at least the following:

(i) A description of each coke oven operation by battery, including work force and operating crew, coking time, operating procedures and maintenance practices;

(ii) Engineer plans and other studies used to determine the controls for the coke battery;

(iii) A report of the technology considered in meeting the permissible exposure limit;

(iv) Monitoring data obtained in accordance with WAC 296-62-20007.

(v) A detailed schedule for the implementation of the engineer and work practice controls specified in subsections (2) through (4) of this section; and

(vi) Other relevant information.

(c) If, after implementing all controls required by subsections (2) through (4) of this section, or after January 20, 1980, whichever is sooner, or after completion of a new or rehabilitated battery the permissible exposure limit is still exceeded, the employer shall develop a detailed written program and schedule for the implementation of any additional engineer controls and work practices necessary to reduce exposure to or below the permissible exposure limit.

(d) Written plans for such programs shall be submitted, upon request, to the director, and shall be available at the worksite for examination and copying by the director, and the authorized employee representative. The plans required under this subsection shall be revised and updated at least every six months to reflect the current status of the program.

(7) Training in compliance procedures. The employer shall incorporate all written procedures and schedules required under this section in the education and training program required under WAC 296-62-20019 and, where appropriate, post in the regulated area.

[Statutory Authority: Chapter 49.17 RCW. 88-23-054 (Order 88-25), § 296-62-20009, filed 11/14/88. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-20009, filed 7/25/86; Order 77-14, § 296-62-20009, filed 7/25/77.]

WAC 296-62-20011 Respiratory protection. (1) General.

For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this section. Compliance with the permissible exposure limit may not be achieved by the use of respirators except during:

(a) Periods necessary to install or implement feasible engineering and work-practice controls;

(b) Work operations, such as maintenance and repair activity, for which engineering and work-practice controls are technologically not feasible;

(c) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limit;

(d) Emergencies.

(2) Respirator program. The employer must implement a respiratory protection program as required by chapter 296-62 WAC, Part E (except WAC 296-62-07130(1) and 296-62-07150 through 296-62-07156).

[Title 296 WAC—p. 1814]

(3) Respirator selection. The employer must select appropriate respirators or combination of respirators from Table I of this section.

TABLE I
RESPIRATORY PROTECTION FOR COKE
OVEN EMISSIONS

Airborne concentration of coke oven emissions	Required respirator
(i) Any concentration.	(A) A Type C supplied air respirator operated in pressure demand or other positive pressure or continuous flow mode; or (B) A powered air-purifying particulate filter respirator for dust, mist, and fume; or (C) A powered air-purifying particulate filter respirator combination chemical cartridge and particulate filter respirator for coke oven emissions.
(ii) Concentrations not greater than 1500 µg/m ³ .	(A) Any particulate filter respirator for dust, mist and fume, except single-use respirator; or (B) Any particulate filter respirator or combination chemical cartridge and particulate filter respirator for coke oven emissions; or (C) Any respirator listed in subsection (2)(a)(i) of this section.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-20011, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-16-009 (Order 86-28), § 296-62-20011, filed 7/25/86. Statutory Authority: 49.17.040, 49.17.050, and 49.17.240. 81-16-015 (Order 81-20), § 296-62-20011, filed 7/27/81; Order 77-14, § 296-62-20011, filed 7/25/77.]

WAC 296-62-20013 Protective clothing and equipment. (1) Provision and Use. The employer shall provide and assure the use of appropriate protective clothing and equipment, such as but not limited to:

(a) Flame resistant jacket and pants;

(b) Flame resistant gloves;

(c) Face shields or vented goggles which comply with WAC 296-24-078;

(d) Footwear providing insulation from hot surfaces;

(e) Safety shoes which comply with WAC 296-24-088; and

(f) Protective helmets which comply with WAC 296-24-084.

(2) Cleaning and Replacement.

(a) The employer shall provide the protective clothing required by subsection (1)(a) and (b) of this section in a clean and dry condition at least weekly.

(b) The employer shall clean, launder, or dispose of protective clothing required by subsections (1)(a) and (b) of this section.

(c) The employer shall repair or replace the protective clothing and equipment as needed to maintain their effectiveness.

(d) The employer shall assure that all protective clothing is removed at the completion of a work shift only in change rooms prescribed in WAC 296-62-20015.

(e) The employer shall assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the changeroom.

(f) The employer shall inform any person who cleans or launders protective clothing required by this section, of the potentially harmful effects of exposure to coke oven emissions.

[Order 77-14, § 296-62-20013, filed 7/25/77.]

WAC 296-62-20015 Hygiene facilities and practices.

(1) Change rooms. The employer shall provide clean change rooms equipped with storage facilities for street clothes and separate storage facilities for protective clothing and equipment whenever employees are required to wear protective clothing and equipment in accordance with WAC 296-62-20013.

(2) Showers.

(a) The employer shall assure that employees working in the regulated area shower at the end of the work shift.

(b) The employer shall provide shower facilities in accordance with WAC 296-24-12009.

(3) Lunchrooms. The employer shall provide lunchroom facilities which have a temperature controlled, positive pressure, filtered air supply, and which are readily accessible to employees working in the regulated area.

(4) Lavatories.

(a) The employer shall assure that employees working in the regulated area wash their hands and face prior to eating.

(b) The employer shall provide lavatory facilities in accordance with WAC 296-24-12007.

(5) Prohibition of activities in the regulated area.

(a) The employer shall assure that in the regulated area, food or beverages are not present or consumed, smoking products are not present or used, and cosmetics are not applied, except, that these activities may be conducted in the lunchrooms, change rooms and showers required under subsection (1)-(3) of this section.

(b) Drinking water may be consumed in the regulated area.

[Order 77-14, § 296-62-20015, filed 7/25/77.]

WAC 296-62-20017 Medical surveillance. (1) General requirements.

(a) Each employer shall institute a medical surveillance program for all employees who are employed in the regulated areas at least 30 days per year.

(b) This program shall provide each employee covered under subsection (1)(a) of this section with an opportunity for medical examinations in accordance with this section.

(c) The employer shall inform any employee who refuses any required medical examination of the possible health consequences of such refusal and shall obtain a signed statement

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from the employee indicating that the employee understands the risk involved in the refusal to be examined.

(d) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician, and are provided without cost to the employee.

(2) Initial examinations. At the time of initial assignment to a regulated area or upon the institution of the medical surveillance program, the employer shall provide a medical examination including at least the following elements:

(a) A work history and medical history which shall include smoking history and the presence and degree of respiratory symptoms, such as breathlessness, cough, sputum production, and wheezing;

(b) A 14" x 17" posterior-anterior chest x-ray and International Labour Office UICC/Cincinnati (ILO U/C) rating;

(c) Pulmonary function tests including forced vital capacity (FVC) and forced expiratory volume at one second (FEV 1.0) with recording of type of equipment used;

(d) Weight;

(e) A skin examination;

(f) Urinalysis for sugar, albumin, and hematuria; and

(g) A urinary cytology examination.

(3) Periodic examinations.

(a) The employer shall provide the examinations specified in subsections (2)(a)-(f) of this section at least annually for employees covered under subsection (1)(a) of this section.

(b) The employer shall provide the examinations specified in subsection (2)(a) and (c)-(g) of this section at least semi-annually for employees 45 years of age or older or with five or more years employment in the regulated area.

(c) Whenever an employee who is 45 years of age or older or with five or more years employment in the regulated area transfers or is transferred from employment in a regulated area, the employer shall continue to provide the examinations specified in subsections (2)(a) and (c)-(g) of this section semi-annually, as long as that employee is employed by the same employer or a successor employer.

(d) The employer shall provide the x-ray specified in subsection (2)(b) of this section at least annually for employees covered under this subsection.

(e) Whenever an employee has not taken the examination specified in subsections (3)(a)-(c) of this section within the six months preceding the termination of employment, the employer shall provide such examinations to the employee upon termination of employment.

(4) Information provided to the physician. The employer shall provide the following information to the examining physician:

(a) A copy of this regulation and its Appendixes;

(b) A description of the affected employee's duties as they relate to the employee's exposure;

(c) The employee's exposure level or anticipated exposure level;

(d) A description of any personal protective equipment used or to be used; and

(e) Information from previous medical examinations of the affected employee which is not readily available to the examining physician.

(5) Physician's written opinion.

(a) The employer shall obtain a written opinion from the examining physician which shall include:

(i) The results of the medical examinations;

(ii) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from exposure to coke oven emissions;

(iii) Any recommended limitations upon the employee's exposure to coke oven emissions or upon the use of protective clothing or equipment such as respirators; and

(iv) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further explanation or treatment.

(b) The employer shall instruct the physician not to reveal in the written opinion specific findings or diagnoses unrelated to occupational exposure.

(c) The employer shall provide a copy of the written opinion to the affected employee.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-62-20017, filed 8/17/99, effective 12/1/99; 98-02-030, § 296-62-20017, filed 12/31/97, effective 1/31/98; Order 77-14, § 296-62-20017, filed 7/25/77.]

WAC 296-62-20019 Employee information and training. (1) Training program.

(a) The employer shall institute a training program for employees who are employed in the regulated area and shall assure their participation.

(b) The training program shall be provided as of January 20, 1977, for employees who are employed in the regulated area at that time or at the time of initial assignment to a regulated area.

(c) The training program shall be provided at least annually for all employees who are employed in the regulated area, except that training regarding the occupational safety and health hazards associated with exposure to coke oven emissions and the purpose, proper use, and limitations of respiratory protective devices shall be provided at least quarterly until January 20, 1978.

(d) The training program shall include informing each employee of:

(i) The information contained in the substance information sheet for coke oven emissions (Appendix A);

(ii) The purpose, proper use, and limitations of respiratory protective devices in addition to other information as required by chapter 296-62 WAC, Part E (see WAC 296-62-07117, 296-62-07172, and 296-62-07186 through 296-62-07190).

(iii) The purpose for and a description of the medical surveillance program required by WAC 296-62-20017 including information on the occupational safety and health hazards associated with exposure to coke oven emissions;

(iv) A review of all written procedures and schedules required under WAC 296-62-20009; and

(v) A review of this standard.

(2) Access to training materials.

(a) The employer shall make a copy of this standard and its appendixes readily available to all employees who are employed in the regulated area.

[Title 296 WAC—p. 1816]

(b) The employer shall provide all materials relating to the employee information and training program to the director.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-62-20019, filed 5/4/99, effective 9/1/99; Order 77-14, § 296-62-20019, filed 7/25/77.]

WAC 296-62-20021 Precautionary signs and labels.

(1) General.

(a) The employer may use labels or signs required by other statutes, regulations or ordinances in addition to, or in combination with, signs and labels required by this section.

(b) The employer shall assure that no statement appears on or near any sign required by this section which contradicts or detracts from the effects of the required sign.

(c) The employer shall assure that signs required by this section are illuminated and cleaned as necessary so that the legend is readily visible.

(2) Signs.

(a) The employer shall post signs in the regulated area bearing the legends:

DANGER

CANCER HAZARD

AUTHORIZED PERSONNEL ONLY

NO SMOKING OR EATING

(b) In addition, not later than January 20, 1978, the employer shall post signs in the areas where the permissible exposure limit is exceeded bearing the legend:

RESPIRATOR REQUIRED

(3) Labels. The employer shall apply precautionary labels to all containers of protective clothing contaminated with coke oven emissions. The label shall bear the following legend:

CAUTION

CLOTHING CONTAMINATED WITH COKE

EMISSIONS

DO NOT REMOVE DUST BY BLOWING OR SHAKING

[Order 77-14, § 296-62-20021, filed 7/25/77.]

WAC 296-62-20023 Recordkeeping. (1) Exposure measurements. The employer shall establish and maintain an accurate record of all measurements taken to monitor employee exposure to coke oven emissions required in WAC 296-62-20007.

(a) This record shall include:

(i) Name, social security number, and job classification of the employees monitored;

(ii) The date(s), number, duration and results of each of the samples taken, including a description of the sampling

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procedure used to determine representative employee exposure where applicable;

(iii) The type of respiratory protective devices worn, if any;

(iv) A description of the sampling and analytical methods used and evidence of their accuracy; and

(v) The environment variables that could affect the measurement of employee exposure.

(b) The employer shall maintain this record for at least 40 years or for the duration of employment plus 20 years, whichever is longer.

(2) Medical surveillance. The employer shall establish and maintain an accurate record for each employee subject to medical surveillance as required by WAC 296-62-20017.

(a) The record shall include:

(i) The name, social security number, and description of duties of the employee;

(ii) A copy of the physician's written opinion;

(iii) The signed statement of any refusal to take a medical examination under WAC 296-62-20017; and

(iv) Any employee medical complaints related to exposure to coke oven emissions.

(b) The employer shall keep, or assure that the examining physician keeps, the following medical records:

(i) A copy of the medical examination results including medical and work history required under WAC 296-62-20017;

(ii) A description of the laboratory procedures used and a copy of any standards or guidelines used to interpret the test results;

(iii) The initial x-ray;

(iv) The x-rays for the most recent 5 years;

(v) Any x-ray with a demonstrated abnormality and all subsequent x-rays;

(vi) The initial cytologic examination slide and written description;

(vii) The cytologic examination slide and written description for the most recent 10 years; and

(viii) Any cytologic examination slides with demonstrated atypia, if such atypia persists for 3 years, and all subsequent slides and written descriptions.

(c) The employer shall maintain medical records required under subsection (2) of this section for at least 40 years, or for the duration of employment plus 20 years, whichever is longer.

(3) Availability.

(a) The employer shall make available upon request all records required to be maintained by this section to the director for examination and copying.

(b) Employee exposure measurement records and employee medical records required by this subsection shall be provided upon request to employees, designated representatives, and the assistant director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(c) The employer shall make available upon request employee medical records required to be maintained by subsection (2) of this section to a physician designated by the affected employee or former employee.

(4) Transfer of records.

(a) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by this section.

(b) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, these records shall be transmitted by registered mail to the director.

(c) At the expiration of the retention period for the records required to be maintained under subsections (1) and (2) of this section, the employer shall transmit these records by registered mail to the director or shall continue to retain such records.

(d) The employer shall also comply with any additional requirements involving transfer of records set forth in WAC 296-62-05215.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-62-20023, filed 8/27/81; Order 77-14, § 296-62-20023, filed 7/25/77.]

WAC 296-62-20025 Observation of monitoring. (1)

Employee observation. The employer shall provide affected employees or their representatives an opportunity to observe any measuring or monitoring of employee exposure to coke oven emissions conducted pursuant to WAC 296-62-20007.

(2) Observation procedures.

(a) Whenever observation of the measuring or monitoring of employee exposure to coke oven emissions requires entry into an area where the use of protective clothing or equipment is required, the employer shall provide the observer with and assure the use of such equipment and shall require the observer to comply with all other applicable safety and health procedures.

(b) Without interfering with the measurement, observers shall be entitled to:

(i) An explanation of the measurement procedures;

(ii) Observe all steps related to the measurement of coke oven emissions performed at the place of exposure; and

(iii) Record the results obtained.

[Order 77-14, § 296-62-20025, filed 7/25/77.]

WAC 296-62-20027 Appendix A—Coke oven emissions substance information sheet.

APPENDIX A

COKE OVEN EMISSIONS SUBSTANCE INFORMATION SHEET

I. SUBSTANCE IDENTIFICATION

(1) Substance: Coke oven emissions

(2) Definition: The benzene-soluble fraction of total particulate matter present during the destructive distillation or carbonization of coal for the production of coke.

(3) Permissible exposure limit: 150 micrograms per cubic meter of air determined as an average over an 8-hour period.

(4) Regulated areas: Only employees authorized by your employer should enter a regulated area. The employer is required to designate the following areas as regulated

areas: the coke oven battery, including topside and its machinery, pushside and its machinery, and the screening station; and the wharf, the beehive ovens and machinery.

II. HEALTH HAZARD DATA

Exposure to coke oven emissions is a cause of lung cancer, and possibly kidney cancer, in humans. Although it does not have an excess number of skin cancer cases in humans, repeated skin contact with coke oven emissions should be avoided.

III. PROTECTIVE CLOTHING AND EQUIPMENT

- (1) **Respirators:** Respirators will be provided by your employer for routine use if your employer is in the process of implementing engineering and work practice controls or where engineering and work practice controls are not feasible or insufficient. You must wear respirators for nonroutine activities or in emergency situations where you are likely to be exposed to levels of coke oven emissions in excess of the permissible exposure limit. Since how well your respirator fits your face is very important, your employer is required to conduct fit tests to make sure the respirator seals properly when you wear it. These tests are simple and rapid and will be explained to you during your training sessions.
- (2) **Protective clothing:** Your employer is required to provide, and you must wear, appropriate, clean, protective clothing and equipment to protect your body from repeated skin contact with coke oven emissions and from the heat generated during the coking process. This clothing should include such items as jacket and pants and flame resistant gloves. Protective equipment should include face shield or vented goggles, protective helmets and safety shoes, insulated from hot surfaces where appropriate.

IV. HYGIENE FACILITIES AND PRACTICES

You must not eat, drink, smoke, chew gum or tobacco, or apply cosmetics in the regulated area, except that drinking water is permitted. Your employer is required to provide lunchrooms and other areas for these purposes.

Your employer is required to provide showers, washing facilities, and change rooms. If you work in a regulated area, you must wash your face, and hands before eating. You must shower at the end of the work shift. Do not take used protective clothing out of the change rooms without your employer's permission. Your employer is required to provide for laundering or cleaning of your protective clothing.

V. SIGNS AND LABELS

Your employer is required to post warning signs and labels for your protection. Signs must be posted in regulated areas. The signs must warn that a cancer hazard is present, that only authorized employees may enter the area, and that no smoking or eating is allowed. In regulated areas where coke oven emissions are above the permissible exposure limit, the signs should also warn that respirators must be worn.

VI. MEDICAL EXAMINATIONS

If you work in a regulated area at least 30 days per year, your employer is required to provide you with a medical examination every year. The medical examination must include a medical history, a chest x-ray; pulmonary function test; weight comparison; skin examination; a urinalysis and a urine cytology exam for the early detection of urinary cancer. The urine cytology exam is only included in the initial exam until you are either forty-five years or older, or have five or more years employment in the regulated areas when the medical exams including this test, but excepting the x-ray exam, are to be given every six months; under these conditions, you are to be given an x-ray exam at least once a year. The examining physician will provide a written opinion to your employer containing the results of the medical exams. You should also receive a copy of this opinion.

VII. OBSERVATION OF MONITORING

Your employer is required to monitor your exposure to coke oven emissions and you are entitled to observe the monitoring procedure. You are entitled to receive an explanation of the measurement procedure, observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you must also be provided with and must wear the protective clothing and equipment.

VIII. ACCESS TO RECORDS

You or your representative are entitled to records of your exposure to coke oven emissions upon request to your employer. Your medical examination records can be furnished to your physician upon request to your employer.

IX. TRAINING AND EDUCATION

Additional information on all of these items plus training as to hazards of coke oven emissions and the engineering and work practice controls associated with your job will also be provided by your employer.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-62-20027, filed 8/17/99, effective 12/1/99; 99-10-071, § 296-62-20027, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 98-02-030, § 296-62-20027, filed 12/31/97, effective 1/31/98; Order 77-14, Appendix A (codified as WAC 296-62-20027), filed 7/25/77.]

WAC 296-62-20029 Appendix B—Industrial hygiene and medical surveillance guidelines.

APPENDIX B

INDUSTRIAL HYGIENE AND MEDICAL SURVEILLANCE GUIDELINES

I. INDUSTRIAL HYGIENE GUIDELINES

- (1) **Sampling.** (Benzene-Soluble Fraction Total Particulate Matter.)

Samples collected should be full shift (8-hour) samples. Sampling should be done using a personal sampling pump with pulsation damper at a flow rate of 2 liters per minute. Samples should be collected on 0.8 micrometer pore size silver membrane filters (37 mm diameter) preceded by Gelman glass fiber type A filters encased in three-piece plastic (polystyrene) field monitor cassettes. The cassette face cap should be on and the plug removed. The rotameter should be checked every hour to ensure that proper flow rates are maintained.

A minimum of three full-shift samples should be collected for each job classification on each battery, at least one from each shift. If disparate results are obtained for particular job classification, sampling should be repeated. It is advisable to sample each shift on more than one day to account for environmental variables (wind, precipitation, etc.) which may affect sampling. Differences in exposures among different work shifts may indicate a need to improve work practices on a particular shift. Sampling results from different shifts for each job classification should not be averaged. Multiple samples from same shift may be used to calculate an average exposure for a particular job classification.

(2) Analysis.

(a) All extraction glassware is cleaned with dichromic acid cleaning solution, rinsed with tap water, then deionized water, acetone, and allowed to dry completely. The glassware is rinsed with nanograde benzene before use. The Teflon cups are cleaned with benzene then with acetone.

(b) Pre-weigh the 2 ml Perkin-Elmer Teflon cups to one hundredth of a milligram on a Perkin-Elmer autobalance AD 2 Tare weight of the cups is about 50 mg.

(c) Place the silver membrane filter and glass fiber filter into a 15 ml test tube.

(d) Extract with 5 ml of benzene for five minutes in an ultrasonic cleaner.

(e) Filter the extract in 15 ml medium glass fritted funnels.

(f) Rinse test tube and filters with two 1.5 ml aliquots of benzene and filter through the fritted glass funnel.

(g) Collect the extract and two rinses in a 10 ml Kontes graduated evaporative concentrator.

(h) Evaporate down to a 1 ml while rinsing the sides with benzene.

(i) Pipet 0.5 ml into the Teflon cup and evaporate to dryness in a vacuum oven at 40°C for 3 hours.

(j) Weight the Teflon cup and the weight gain is due to the benzene soluble residue in half the sample.

II. MEDICAL SURVEILLANCE GUIDELINES

(1) General.

The minimum requirements for the medical examination for coke oven workers are given in WAC 296-62-20017.

The initial examination is to be provided to all coke oven workers who work at least thirty days in the regulated area. The examination includes a 14" x 17" posterior-

anterior chest x-ray and a ILO/UC rating to assure some standardization of x-ray reading, pulmonary function tests (FVC and FEV 1.0), weight, urinalysis, skin examination and a urinary cytologic examination. These tests are to serve as the baseline for comparing the employee's future test results. Periodic exams include all the elements of the initial exams, except that the urine cytologic test is to be performed only on those employees who are forty-five years of age or older or who have worked for five or more years in the regulated area; periodic exams, with the exception of x-rays, are to be performed semiannually for this group instead of annually; for this group, x-rays will continue to be given at least annually. The examination contents are minimum requirements, additional tests such as lateral and oblique x-rays or additional pulmonary function tests may be performed if deemed necessary.

(2) Pulmonary function tests.

Pulmonary function tests should be performed in a manner which minimizes subject and operator bias. There has been shown to be learning effects with regard to the results obtained from certain tests, such as FEV 1.0. Best results can be obtained by multiple trials for each subject. The best of three trials or the average of the last three of five trials may be used in obtaining reliable results. The type of equipment used (manufacturer, model, etc.) should be recorded with the results as reliability and accuracy varies and such information may be important in the evaluation of test results. Care should be exercised to obtain the best possible testing equipment.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-62-20029, filed 8/17/99, effective 12/1/99; 98-02-030, § 296-62-20029, filed 12/31/97, effective 1/31/98; Order 77-14, Appendix B (codified as WAC 296-62-20029), filed 7/25/77.]

PART P—HAZARDOUS WASTE OPERATIONS AND TREATMENT, STORAGE, AND DISPOSAL FACILITIES

WAC 296-62-300 Hazardous waste operations and treatment, storage, and disposal facilities.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-300, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-300, filed 7/20/94, effective 9/20/94; 91-24-017 (Order 91-07), § 296-62-300, filed 11/22/91, effective 12/24/91; 90-20-091 (Order 90-14), § 296-62-300, filed 10/1/90, effective 11/15/90; 89-21-018 (Order 89-10), § 296-62-300, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-300, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30001 Scope and application. (1) Scope. This section covers employers who have employees who work in the following operations:

(a) Clean-up operations required by a governmental body, whether federal, state, local, or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the pres-

ence or absence of hazardous substances has been ascertained);

(b) Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq.);

(c) Voluntary clean-up operations at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites;

(d) Operations involving hazardous wastes that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 under RCRA; or by agencies under agreement with U.S.E.P.A. to implement RCRA regulations.

(2) Application.

(a) All requirements of this chapter and chapters 296-24 and 296-155 WAC apply to hazardous waste operations whether covered by this part or not. If there is a conflict or overlap, the provision more protective of employee safety and health must apply.

(b) Hazardous substance clean-up operations within the scope of subsection (1)(a), (b), and (c) of this section must comply with all sections of WAC 296-62-410, Part R, Emergency response to hazardous substance release.

(c) Operations within the scope of subsection (1)(d) of this section must comply only with the requirements of WAC 296-62-3140 through 296-62-31430.

Notes and Exceptions:

(i) All provisions of WAC 296-62-3140 through 296-62-31430 cover any treatment, storage, or disposal (TSD) operation regulated by 40 CFR Parts 264 and 265 or by state law authorized under RCRA, and required to have a permit or interim status from EPA under 40 CFR 270.1 or from a state agency under RCRA.

(ii) Employers who are not required to have a permit or interim status because they are conditionally exempt small quantity generators under 40 CFR 261.5 or are generators who qualify under 40 CFR 262.34 for exemptions from regulation under 40 CFR Parts 264, 265, and 270 ("excepted employers") are not covered by WAC 296-62-31405 through 296-62-31445. Excepted employers who are required by the EPA or state agency to have their employees engage in emergency response or who direct their employees to engage in emergency response are covered by WAC 296-62-31450 through 296-62-31470 and cannot be exempted by WAC 296-62-31455. Excepted employers who are not required to have employees engage in emergency response, who direct their employees to evacuate in the case of such emergencies and who meet the requirements of WAC 296-62-31455 are exempt from the balance of WAC 296-62-31450 through 296-62-31470.

(iii) If an area is used primarily for treatment, storage or disposal, any emergency response operations in that area must comply with WAC 296-62-31410 through 296-62-31470. In other areas not used primarily for treatment, storage or disposal, any emergency response operations must comply with WAC 296-62-410, Part R, Emergency response to hazardous substance release. Compliance with the requirements of WAC 296-62-410, Part R, Emergency response to hazardous substance release must be deemed to be in compli-

ance with the requirements of WAC 296-62-31450 through 296-62-31470.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30001, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30003 Definitions. "Buddy system" means a system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

"Clean-up operation" means an operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment.

"Contamination reduction zone" means the buffer between the exclusion zone and the outermost clean zone.

"Decontamination" means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.

"Emergency response" or "responding to emergencies" means a response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area or by maintenance personnel are not considered to be emergency responses within the scope of this standard. Responses to release of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses.

"Exclusion zone" means the innermost zone at a site where contamination does occur.

"Facility" means:

Any building structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly-owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft; or

Any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

"Hazardous substance" means any substance designated or listed under this definition, exposure to which results or may result in adverse effects on the health or safety of employees:

Any substance defined under section 101(14) of CERCLA;

Any biological agent and other disease-causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer,

genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring;

Any substance listed by the United States Department of Transportation as hazardous materials under WAC 480-12-195; and

Hazardous waste as herein defined.

"Hazardous waste" means:

A waste or combination of wastes as defined as a "health hazard."

"Hazardous waste operation" means any operation conducted within the scope of this standard.

"Hazardous waste site" or "site" means any facility or location within the scope of this standard at which hazardous waste operations take place.

"Health hazard" means a chemical, mixture of chemicals, or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes. Further definition of the terms used above can be found in Appendix A to chapter 296-62 WAC, Part C.

"IDLH" or "immediately dangerous to life or health" means any atmospheric concentration of any toxic, corrosive, or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

"Oxygen deficiency" means that concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

"Permissible exposure limit" means the exposure, inhalation, or dermal permissible limit specified in WAC 296-62-075 through 296-62-07515.

"Published exposure level" means the exposure limits published in "NIOSH Recommendations for Occupational Health Standards" dated 1986 incorporated by reference, or if none is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "Threshold Limit Values and Biological Exposure Indices for 1988-89" dated 1988 incorporated by reference.

"Postemergency response" means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If postemergency response is performed by an employer's own employees who were part of the initial emergency response, it is considered to be part of the initial response and not postemergency response. However, if a group of an employer's own employees, separate from the group providing initial response, performs the clean-up operation, then the separate group of employees would be consid-

ered to be performing postemergency response and subject to chapter 296-62 WAC, Part R.

"Qualified person" means a person with specific training, knowledge, and experience in the area for which the person has responsibility and the authority to control.

"Site safety and health supervisor (or official)" means the individual located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

"Site work zones" means an exclusion zone, contamination reduction zone, and a clean zone established at a hazardous waste site before clean-up work begins to prevent or reduce the movement of contaminants from the site to uncontaminated areas and to control public, employee, and equipment exposure to hazardous substances.

The exclusion zone is the innermost of the zones and is where contamination does occur. The contamination reduction zone is the zone between the exclusion zone and the clean zone and serves as a transition and buffer between the contaminated and clean zone to further reduce the physical transfer of contaminating substances to the public, employees, and equipment. The clean zone is the outermost of the zones and is a noncontaminated or clean area. The level of contamination in these zones is not defined and some designated exclusion zones can have very little contamination directly affecting employees.

The contaminated reduction corridors are the designated areas within the contaminated reduction zone for the decontamination of personnel and equipment.

"Small quantity generator" means a generator of hazardous wastes who in any calendar month generates no more than 1000 kilograms (2205 pounds) of hazardous waste in that month.

"Uncontrolled hazardous waste site" means an area identified as an uncontrolled hazardous waste site by a governmental body, whether federal, state, local, or other where an accumulation of hazardous substances creates a threat to the health and safety of individuals or the environment or both. Some sites are found on public lands, such as those created by former municipal, county, or state landfills where illegal or poorly managed waste disposal has taken place. Other sites are found on private property, often belonging to generators or former generators of hazardous substance waste. Examples of such sites include, but are not limited to, surface impoundments, landfills, dumps, and tank or drum farms. Normal operations at TSD sites are not covered by this definition.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30003, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3010 Overview of a written safety and health program.

Note: Safety and health programs developed and implemented to meet other federal, state, or local regulations are considered acceptable in meeting this requirement if they cover or are modified to cover the topics required in this section. An additional or separate safety and health program is not required by this section.

Employers must develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program must be designed to identify, evaluate, and control safety and health hazards and provide for emergency response for hazardous waste operations.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-3010, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-62-3010, filed 1/18/95, effective 3/1/95; 89-21-018 (Order 89-10), § 296-62-3010, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3010, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30105 Elements of a safety and health program. The written safety and health program must include the following elements:

- (1) An organizational structure;
- (2) A comprehensive workplan;
- (3) A site-specific safety and health plan which need not repeat the employer's standard operating procedures required in subsection (7) of this section;
- (4) The safety and health training program;
- (5) The medical surveillance program;
- (6) The employer's standard operating procedures for safety and health; and
- (7) Any necessary interface between general program and site specific activities.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30105, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30110 Safety considerations during the initial site excavation. Site excavations created during initial site preparation or during hazardous waste operations must be shored or sloped as appropriate to prevent accidental collapse in accordance with subpart N of chapter 296-155 WAC.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30110, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30115 Notifying contractors and subcontractors of procedures and hazards. An employer who retains contractor or subcontractor services for work in hazardous waste operations must inform those contractors, subcontractors, or their representatives of the site emergency response procedures and any potential fire, explosion, health, safety, or other hazards of the hazardous waste operation that have been identified by the employer, including those identified in the employer's information program.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30115, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30120 Availability of the safety and health program. The written safety and health program must be made available to any contractor or subcontractor or their representative who will be involved with the hazardous waste operation; to employees; to employee designated representatives; to WISHA personnel, and to personnel of other federal, state, or local agencies with regulatory authority over the site.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30120, filed 3/23/99, effective 6/23/99.]

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WAC 296-62-30125 Organizational structure of the site safety and health program. (1) The organizational structure of the site safety and health program must establish the specific chain of command and specify the overall responsibilities of supervisors and employees. It must include at a minimum, the following elements:

- (a) A general supervisor who has the responsibility and authority to direct all hazardous waste operations.
- (b) A site safety and health supervisor who has the responsibility and authority to develop and implement the site safety and health plan and verify compliance.
- (c) All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities.
- (d) The lines of authority, responsibility, and communication.
- (2) The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30125, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30130 Comprehensive workplan of the site program. The comprehensive workplan must address the tasks and objectives of site operations and the logistics and resources required to reach those tasks and objectives. The comprehensive workplan must:

- (1) Address anticipated clean-up activities as well as normal operating procedures which need not repeat the employer's procedures available elsewhere.
- (2) Define work tasks and objectives and identify the methods for accomplishing those tasks and objectives.
- (3) Establish personnel requirements for implementing the plan.
- (4) Provide for the implementation of the training required in WAC 296-62-3040.
- (5) Provide for the implementation of the required informational programs required in WAC 296-62-3080.
- (6) Provide for the implementation of the medical surveillance program described in WAC 296-62-3050 through 296-62-30535.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30130, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30135 Overview of a site-specific safety and health plan. (1) A written site-specific safety and health plan, must be kept on site. It must address the safety and health hazards of each phase of site operation and include the requirements and procedures for employee protection.

(2) Elements of a site-specific safety and health plan. The site-specific safety and health plan must include the following elements:

- (a) The names of key personnel and alternates responsible for site safety and health, including a site safety and health supervisor.
- (b) A safety and health risk or hazard analysis for each site task and operation found in the workplan.
- (c) Employee training assignments to assure compliance with WAC 296-62-3040 through 296-62-30465.

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(d) Personal protective equipment to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program in WAC 296-62-30615.

(e) A medical surveillance program meeting the requirements in WAC 296-62-3050 through 296-62-30535.

(f) Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.

(g) Site control measures in WAC 296-62-3030 through 296-62-30315.

(h) Decontamination procedures in WAC 296-62-3100 through 296-62-31015.

(i) An emergency response plan meeting the requirements of chapter 296-62 WAC, Part R for safe and effective responses to emergencies, including the necessary PPE and other equipment.

(j) Confined space and permit-required confined space entry procedures as addressed in chapter 296-62 WAC, Part M.

(k) A spill containment program meeting the requirements of WAC 296-62-3090 through 296-62-30940.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30135, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30140 Preentry briefing of the site-specific safety and health plan. The site-specific safety and health plan must provide for preentry briefings to be held prior to initiating any site activity, and at such other times as necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed. The information and data obtained from site characterization and analysis work required in WAC 296-62-3020 through 296-62-30235 must be used to prepare and update the site safety and health plan.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30140, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30145 Effectiveness of site safety and health plan. Inspections must be conducted by the site safety and health supervisor or, in the absence of that individual, another individual who is knowledgeable in occupational safety and health acting on behalf of the employer as necessary to determine the effectiveness of the site safety and health plan. Any deficiencies in the effectiveness of the site safety and health plan must be corrected by the employer.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30145, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3020 Site characterization and analysis. Hazardous waste sites must be evaluated in accordance with this section to identify specific site hazards and to determine the appropriate safety and health control procedures needed to protect employees from the identified hazards.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3020, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-3020, filed 8/3/94, effective 9/12/94; 90-20-091 (Order 90-14), § 296-62-3020, filed 10/1/90, effective 11/15/90; 89-21-018 (Order 89-

(2001 Ed.)

10), § 296-62-3020, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3020, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30205 Preliminary evaluation. A preliminary evaluation of a site's characteristics must be performed prior to site entry by a qualified person in order to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics must be performed by a qualified person in order to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and personal protective equipment for the tasks to be performed.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30205, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30210 Hazard identification. All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH), or other conditions that may cause death or serious harm, must be identified during the preliminary survey and evaluated during the detailed survey. Examples of such hazards include, but are not limited to, confined space entry, potentially explosive or flammable situations, visible vapor clouds, or areas where biological indicators such as dead animals or vegetation are located.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30210, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30215 Required information. The following information to the extent available must be obtained by the employer prior to allowing employees to enter a site:

- (1) Location and approximate size of the site.
- (2) Description of the response activity and/or the job task to be performed.
- (3) Duration of the planned employee activity.
- (4) Site topography and accessibility by air and roads.
- (5) Safety and health hazards expected at the site.
- (6) Pathways for hazardous substance dispersion.
- (7) Present status and capabilities of emergency response teams that would provide assistance to hazardous waste clean-up site employees at the time of an emergency.
- (8) Hazardous substances and health hazards involved or expected at the site and their chemical and physical properties.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30215, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30220 Personal protective equipment. Personal protective equipment (PPE) must be provided and used during initial site entry in accordance with the following requirements:

- (1) Based upon the results of the preliminary site evaluation, an ensemble of PPE must be selected and used during initial site entry which will provide protection to a level of exposure below established permissible exposure limits and published exposure levels for known or suspected hazardous substances and health hazards, and which will provide protection against other known and suspected hazards identified during the preliminary site evaluation. If there is no permissi-

ble exposure limit or published exposure level, the employer may use other published studies and information as a guide to appropriate personal protective equipment. Level A and Level B personal protective equipment is required for the most hazardous actual or potential exposures.

(2) If positive-pressure self-contained breathing apparatus is not used as part of the entry ensemble, and if respiratory protection is warranted by the potential hazards identified during the preliminary site evaluation, an escape self-contained breathing apparatus of at least five minute's duration must be carried by employees during initial site entry.

(3) If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site an ensemble providing protection equivalent to Level B PPE must be provided as minimum protection and direct reading instruments must be used as appropriate for identifying IDLH conditions. (See WAC 296-62-3170 - Appendix B for a description of Level B hazards and the recommendations for Level B protective equipment.)

(4) Once the hazards of the site have been identified, the appropriate PPE must be selected and used in accordance with WAC 296-62-3060 through 296-62-30615.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30220, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30225 Monitoring. The following monitoring must be conducted during initial site entry when the site evaluation produces information that shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient to rule out these possible conditions:

(1) Monitoring with direct reading instruments for hazardous levels of ionizing radiation.

(2) Monitoring the air with appropriate direct reading equipment (i.e., combustible gas meters, detector tubes) for IDLH and other conditions that may cause death or serious harm (combustible or explosive atmospheres, oxygen deficiency, toxic substances).

(3) Visually observing for signs of actual or potential IDLH or other dangerous conditions.

(4) An ongoing air monitoring program in accordance with WAC 296-62-30710 and 296-62-30715 must be implemented after site characterization has determined the site is safe for the start-up of operations.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30225, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30230 Risk identification. Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances must be identified. Employees who will be working on the site must be informed of any risks that have been identified. In situations covered by chapter 296-62 WAC, Part C, training required by those standards need not be duplicated.

Note: Risks to consider include, but are not limited to:

(1) Exposures exceeding the permissible exposure limits and published exposure levels.

(2) IDLH concentrations.

(3) Potential skin absorption and irritation sources.

[Title 296 WAC—p. 1824]

(4) Potential eye irritation sources.

(5) Explosion sensitivity and flammability ranges.

(6) Oxygen deficiency.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30230, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30235 Employee notification. Any information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site that is available to the employer and relevant to the duties an employee is expected to perform must be made available to all employees prior to the commencement of their work activities. The employer may use information developed for the hazard communication standard, chapter 296-62 WAC, Part C, for this purpose.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30235, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3030 Site control. Appropriate site control procedures must be implemented to control employee exposure to hazardous substances before clean-up work begins.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3030, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-62-3030, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3030, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30305 Site control program. A site control program for protecting employees which is part of the employer's site safety and health program required in WAC 296-62-3010 through 296-62-30145 must be developed during the planning stages of a hazardous waste clean-up operation and modified as necessary as new information becomes available.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30305, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30310 Elements of the site control program. The site control program must, as a minimum, include: A site map; site work zones; the use of a "buddy system"; site communications including alerting means for emergencies; the standard operating procedures or safe work practices; and, identification of nearest medical assistance. Where these requirements are covered elsewhere they need not be repeated.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30310, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30315 Site work zones. (1) The site work zones must be the exclusion zone, contamination reduction zone, and the clean zone.

(2) Decontamination procedures must take place in the contamination reduction corridor consisting, if practical, of separate corridors for personnel and for equipment.

(3) An entry and exit check point must be established at the boundary of the exclusion zone to regulate the flow of personnel and equipment into and out of the zone. Exit from the exclusion zone must be through a contamination reduction corridor.

(4) Access to the contamination reduction zone from the clean zone is through a control point. Personnel entering or working in the contamination zone must wear the prescribed personnel protective equipment, if required, for working in this zone. Entering the clean zone requires removal of any protective equipment worn in the contamination reduction zone.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30315, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3040 General training requirements and the employees covered. (1) All employees working on site (such as but not limited to equipment operators, general laborers, and others) exposed to hazardous substances, health hazards, or safety hazards, and their supervisors and management responsible for the site, must receive training meeting the requirements of this subsection before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards, and they must review training as specified in this subsection.

(2) Employees must not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-3040, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW, 95-04-007, § 296-62-3040, filed 1/18/95, effective 3/1/95; 91-24-017 (Order 91-07), § 296-62-3040, filed 11/22/91, effective 12/24/91; 90-20-091 (Order 90-14), § 296-62-3040, filed 10/1/90, effective 11/15/90; 89-21-018 (Order 89-10), § 296-62-3040, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3040, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30405 Elements covered in training. The training must thoroughly cover the following:

- (1) Names of personnel and alternates responsible for site safety and health;
- (2) Safety, health, and other hazards present on the site;
- (3) Use of personal protective equipment;
- (4) Work practices by which the employee can minimize risks from hazards;
- (5) Safe use of engineering controls and equipment on the site;
- (6) Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards; and
- (7) The contents of the site safety and health plan set forth in WAC 296-62-31035 (2)(g) through (j).

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30405, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30410 Initial training. General site workers (such as equipment operators, general laborers, and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards must receive the following required training:

- (1) General site workers required to wear Level A or Level B personal protective equipment because of the types of hazards to which they are exposed or have the potential for being exposed are required to have 80 hours of training and a

minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

(2) General site workers required to wear Level C or D personal protective equipment, equipment operators or transport vehicle operators, are required to have 40 hours of training and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

(3) General site workers on site only occasionally for specific limited tasks, and supervisors not working in the two inner zones are required to have 24 hours of training. For example, certain Environmental Protection Agency, and department of ecology employees, labor and industries inspectors and other short-term monitoring and surveying personnel would be required to only have 24 hours of training if they are on-site only occasionally for a specific limited task and are unlikely to be exposed over permissible exposure levels and published exposure limits. A minimum of one day actual field experience under direct supervision is also required.

(4) Workers regularly on site who work in areas which have been monitored and fully characterized indicating that exposures are under permissible exposure limits and published exposure limits where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, must receive a minimum of 24 hours of instruction off the site and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

(5) Workers with 24 hours of training who are covered by subsections (3) and (4) of this section, and who become general site workers or who are required to wear respirators, must have the additional 16 hours and two days of training necessary to total the training specified in subsection (2) of this section.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30410, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30415 Management and supervisor training. On-site management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations must receive the same initial training as listed in WAC 296-62-30410, and three days of supervised field experience and at least eight additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-30415, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30420 Law enforcement at illicit drug labs. Exception: WISHA did not intend application of the 80 hour training requirement to law enforcement personnel required to enter illicit drug labs, secure the premise, and obtain necessary evidence for law enforcement purposes. Attendance at a specific 40 hours course, such as that presented by the criminal justice training commission, is acceptable.

Note: If cleanup activities are conducted by law enforcement personnel, then appropriate hazardous waste cleanup training would be required.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30420, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30425 Training course content for 40 and 80 hour hazardous waste cleanup courses. As a minimum, the training course content for the 40 hour and 80 hour training program must include the following topics:

(1) Overview of the applicable sections of Part P of chapter 296-62 WAC and the elements of an employer's effective occupational safety and health program.

(2) Effect of chemical exposure to hazardous substances (i.e., toxicity, carcinogens, irritants, sensitizers, etc.).

(3) Effects of biological and radiological exposures.

(4) Fire and explosion hazards (i.e., flammable and combustible liquids, reactive materials).

(5) General safety hazards, including electrical hazards, powered equipment hazards, walking-working surface hazards and those hazards associated with hot and cold temperature extremes.

(6) Permit-required confined space, tank, and vault hazards and entry procedures.

(7) Names of personnel and alternates, where appropriate, responsible for site safety and health at the site.

(8) Specific safety, health, and other hazards that are to be addressed at a site and in the site safety and health plan.

(9) Use of personal protective equipment and the implementation of the personal protective equipment program.

(10) Work practices that will minimize employee risk from site hazards.

(11) Safe use of engineering controls and equipment and any new relevant technology or procedure.

(12) Content of the medical surveillance program and requirements, including the recognition of signs and symptoms of overexposure to hazardous substances.

(13) The contents of an effective site safety and health plan.

(14) Use of monitoring equipment with "hands-on" experience and the implementation of the employee and site monitoring program.

(15) Implementation and use of the information program.

(16) Drum and container handling procedures and the elements of a spill containment program.

(17) Selection and use of material handling equipment.

(18) Methods for assessment of risk and handling of radioactive wastes.

(19) Methods for handling shock-sensitive wastes.

(20) Laboratory waste pack handling procedures.

(21) Container sampling procedures and safeguards.

(22) Safe preparation procedures for shipping and transport of containers.

(23) Decontamination program and procedures.

(24) Emergency response plan and procedures including first aid.

(25) Safe site illumination levels.

(26) Site sanitation procedures and equipment for employee needs.

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(27) Review of the applicable appendices to Part P of chapter 296-62 WAC.

(28) Overview and explanation of WISHA's hazard communication standard Part C of chapter 296-62 WAC.

(29) Sources of reference, additional information and efficient use of relevant manuals and hazard coding systems.

(30) Principles of toxicology and biological monitoring.

(31) Rights and responsibilities of employees and employers under WISHA and CERCLA.

(32) Hands-on field exercises and demonstrations.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30425, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30430 Training content for 24-hour hazardous waste cleanup course. As a minimum, the 24-hour training course required in WAC 296-62-30410 (3) and (4) for employees engaged in occasional visits to uncontrolled hazardous waste sites must include the following topics where they are applicable to the job function to be performed:

(1) Overview of applicable sections of Part P of chapter 296-62 WAC and the elements of the employer's effective occupational safety and health program.

(2) Employee rights and responsibilities under WISHA and CERCLA.

(3) Overview of relevant chemical exposures to hazardous substances (i.e., toxics, carcinogens, irritants, sensitizers, etc.).

(4) Overview of the principles of toxicology and biological monitoring.

(5) Use of monitoring equipment with hands-on practice and an overview of a site monitoring program.

(6) Overview of site hazards including fire and explosion, confined spaces, oxygen deficiency, electrical hazards, powered equipment hazards, walking-working surface hazards.

(7) The contents of an effective site safety and health plan.

(8) Use of personal protective equipment and the implementation of the personal protective equipment program.

(9) Work practices that will minimize employee risk from site hazards.

(10) Site simulations with "hands-on" exercises and practice.

(11) Emergency response planning and response including first aid.

(12) Content of the medical surveillance program and requirements, including the recognition of signs and symptoms of overexposure to hazardous substances.

(13) Decontamination programs and procedures.

(14) Safe use of engineering controls and equipment.

(15) Sources of references and efficient use of relevant manuals and knowledge of hazard coding systems.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30430, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30435 16-hour supplemental training for hazardous waste sites. As a minimum, employees who have received 24 hours of training for hazardous waste site operations must receive training in the following topics

before they are allowed to work as general site workers or if they are required to wear respirators:

- (1) Relevant chemical exposures to hazardous substances beyond that previously covered.
- (2) Site hazards including fire and explosion, confined spaces, oxygen deficiency, electrical, powered equipment, and walking-working surfaces beyond that previously covered.
- (3) Names of personnel and alternates responsible for site safety and health at the site, where appropriate.
- (4) Use of monitoring equipment and the implementation of the employee and the site monitoring program beyond that previously covered.
- (5) Implementation and use of the informational program.
- (6) Drum and container handling procedures and the elements of a spill containment program.
- (7) Selection and use of material handling equipment.
- (8) Methods for assessment of risk and handling of radioactive wastes.
- (9) Methods for handling shock-sensitive wastes.
- (10) Laboratory waste pack handling procedures.
- (11) Container sampling procedures and safeguards.
- (12) Safe preparation procedures for shipping and transport of containers.
- (13) Decontamination program and procedures.
- (14) Safety site illumination levels.
- (15) Site sanitation procedures and equipment.
- (16) Review of the applicable appendices to Part P of chapter 296-62 WAC.
- (17) Overview and explanation of WISHA's Hazard communication standard Part C of chapter 296-62 WAC.
- (18) Sources of reference and additional information.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30435, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30440 Additional 8 hours of training for supervisors and managers. Supervisors and managers must receive an additional eight hours of training in the following subjects:

- (1) Management of hazardous wastes and their disposal.
- (2) Federal, state, and local agencies to be contacted in the event of a release of hazardous substances.
- (3) Management of emergency procedures in the event of a release of hazardous substances.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30440, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30445 Qualifications for trainers. Trainers must be qualified to instruct employees about the subject matter that is being presented in training. Such trainers must have satisfactorily completed a training program for teaching the subjects they are expected to teach, or they must have the academic credentials and instructional experience necessary for teaching the subjects. Instructors must demonstrate competent instructional skills and knowledge of the applicable subject matter.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30445, filed 3/23/99, effective 6/23/99.]

(2001 Ed.)

WAC 296-62-30450 Training certification. Employees and supervisors that have received and successfully completed the training and field experience specified in WAC 296-62-3040 through 296-62-30415 must be certified by their instructor or the head instructor and trained supervisor as having successfully completed the necessary training. A written certificate must be given to each person certified. Any person who has not been certified or who does not meet the requirements of WAC 296-62-30465 must be prohibited from engaging in hazardous waste operations.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30450, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30455 Training requirements for emergency response. Employees who are engaged in responding to hazardous emergency situations at hazardous waste clean-up sites that may expose them to hazardous substances must be trained in how to respond to expected emergencies.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30455, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30460 Refresher training. Employees specified in WAC 296-62-3040 and managers specified in WAC 296-62-30415 must receive eight hours of refresher training annually on the items specified in WAC 296-62-30405 and/or 296-62-30415, any critique of incidents that have occurred in the past year that can serve as training examples of related work, and other relevant topics.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30460, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30465 Equivalent training. Employers who can show by documentation or certification that an employee's work experience and/or training has resulted in training equivalent to that training required in WAC 296-62-3040 through 296-62-30410 must not be required to provide the initial training requirements of those sections to such employees and must provide a copy of the certification or documentation to the employee upon request. However, certified employees or employees with equivalent training new to a site must receive appropriate, site specific training before site entry and have appropriate supervised field experience at the new site. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site work experience. The 80 hours of instruction required can be fulfilled as follows:

(1) Instruction can include a combination of presently available 40 hour training sessions and other related classes or training including additional supervised on-the-job training as long as material covered includes elements required in the training section WAC 296-62-30405 of the regulations. A single 80 hour training session is also acceptable.

(2) Previously attended courses including eight-hour refresher courses apply toward the 80 hour requirement and need not be repeated.

(3) Documentation of previous experience and training by qualified trainers is required of employers and must be available to inspectors for review.

(4) When calculating hours of training, WISHA assumes a "normal" work day to be eight hours with sufficient time for lunch and other breaks.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30465, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3050 Medical surveillance. Employers engaged in operations specified in WAC 296-62-300 (1) and not covered by WAC 296-62-300(2), exceptions; must institute a medical surveillance program.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3050, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 91-11-070 (Order 91-01), § 296-62-3050, filed 5/20/91, effective 6/20/91; 90-20-091 (Order 90-14), § 296-62-3050, filed 10/1/90, effective 11/15/90; 89-21-018, § 296-62-3050, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3050, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30505 Employees covered. The medical surveillance program must be instituted for the following employees:

(1) All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;

(2) All employees who wear a respirator for 30 days or more a year or as required by WAC 296-62-071; and

(3) All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and

(4) Members of HAZMAT teams.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30505, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30510 Frequency of medical examinations and consultations. Medical examinations and consultations shall be made available by the employer to each employee covered under WAC 296-62-3050 on the following schedules:

(1) For employees covered under WAC 296-62-30505 (1), (2), and (4):

(a) Prior to assignment;

(b) At least once every twelve months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate;

(c) At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months;

(d) As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limits, or published exposure levels in an emergency situation;

(e) At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

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(2) For employees covered under WAC 296-62-30505 who may have been injured, received a health impairment, developed signs or symptoms which may have resulted from exposure to hazardous substances resulting from an emergency incident, or exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits or the published exposure levels without the necessary personal protective equipment being used:

(a) As soon as possible following the emergency incident or development of signs or symptoms;

(b) At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30510, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30515 Content of medical examinations and consultations. (1) Medical examinations required by WAC 296-62-30510 must include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the worksite.

(2) The content of medical examinations or consultations made available to employees under this section must be determined by the examining physician. The guidelines in the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (See Appendix D, Reference #9) should be consulted.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30515, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30520 Examination by a physician and costs. All medical examinations and procedures must be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and must be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30520, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30525 Information provided to the physician. The employer must provide one copy of this standard and its appendices to the examining physician, and the following for each employee:

(1) A description of the employee's duties as they relate to the employee's exposures;

(2) The employee's exposure levels or anticipated exposure levels;

(3) A description of any personal protective equipment used or to be used;

(4) Information from previous medical examinations of the employee which is not readily available to the examining physician; and

(5) Information required in WAC 296-62-071 through 296-62-07121.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30525, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30530 Physician's written opinion. (1) The employer must obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

(a) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response or from respirators use.

(b) The physician's recommended limitations upon the employees assigned work.

(c) The results of the medical examination and tests if requested by the employee.

(d) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(2) The written opinion obtained by the employer must not reveal specific findings or diagnoses unrelated to occupational exposures.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30530, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30535 Recordkeeping of medical surveillance activities. (1) An accurate record of the medical surveillance required by this section must be retained. This record must be retained for the period specified and meet the criteria of Part B of chapter 296-62 WAC.

(2) The record required in subsection (1) of this section must include at least the following information:

(a) The name and Social Security number of the employee;

(b) Physicians' written opinions, recommended limitations, and results of examinations and tests;

(c) Any employee medical complaints related to exposure to hazardous substances;

(d) A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30535, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3060 Engineering controls, work practices, and personal protective equipment for employee protection. (1) Engineering controls, work practices, personal protective equipment, or a combination of these must be implemented in accordance with this section to protect employees from exposure to hazardous substances and health hazards.

(a) Engineering controls, work practices, and PPE for substances regulated in chapter 296-62 WAC.

Engineering controls and work practices must be instituted to reduce and maintain employee exposure to or below the permissible exposure limits for substances regulated by this chapter, except to the extent that such controls and practices are not feasible.

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Note: Engineering controls which may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices which may be feasible are removing all nonessential employees from potential exposure during opening of drums, wetting down dusty operations, and locating employees upwind of possible hazards.

(b) Whenever engineering controls and work practices are not feasible, or not required, any reasonable combination of engineering controls, work practices, and PPE must be used to reduce and maintain exposures to or below the permissible exposure limits or dose limits for substances regulated by chapter 296-62 WAC.

(c) The employer must not implement a schedule of employee rotation as a means of compliance with permissible exposure limits or dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

(d) The provisions of WAC 296-62-080 through 296-62-09013, 296-62-09015 through 296-62-09055, and 296-62-100 through 296-62-130 must be followed.

(2) Engineering controls, work practices, and personal protective equipment for substances not regulated in chapter 296-62 WAC. An appropriate combination of engineering controls, work practices, and personal protective equipment must be used to reduce and maintain employee exposure to or below published exposure levels for hazardous substances and health hazards not regulated by chapter 296-62 WAC. The employer may use the published literature and MSDS as a guide in making the employer's determination as to what level of protection the employer believes is appropriate for hazardous substances and health hazards for which there is no permissible exposure limit or published exposure level.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3060, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-3060, filed 7/20/94, effective 9/20/94; 90-20-091 (Order 90-14), § 296-62-3060, filed 10/1/90, effective 11/15/90; 89-21-018, § 296-62-3060, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3060, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30605 Personal protective equipment selection. (1) Personal protective equipment (PPE) must be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis.

(2) Personal protective equipment selection must be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

(3) Positive pressure self-contained breathing apparatus, or positive pressure air-line respirators equipped with an escape air supply must be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(4) Totally encapsulating chemical protective suits (protection equivalent to Level A protection as recommended in Appendix B) must be used in conditions where skin absorption of a hazardous substance may result in a substantial pos-

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sibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(5) The level of protection provided by PPE selection must be increased when additional information or site conditions indicate that increased protection is necessary to reduce employee exposures below permissible exposure limits and published exposure levels for hazardous substances and health hazards. (See WAC 296-62-3170 - Appendix B for guidance on selecting PPE ensembles.)

Note: The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in increased hazardous exposures to employees.

(6) Personal protective equipment must be selected and used to meet the requirements of chapter 296-24 WAC, Part A-2, and additional requirements specified in this part.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30605, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30610 Totally encapsulating chemical protective suits. (1) Totally encapsulating suits must protect employees from the particular hazards which are identified during site characterization and analysis.

(2) Totally encapsulating suits must be capable of maintaining positive air pressure. (See WAC 296-62-3160 - Appendix A for a test method which may be used to evaluate this requirement.)

(3) Totally encapsulating suits must be capable of preventing inward test gas leakage of more than 0.5 percent. (See WAC 296-62-3160 - Appendix A for a test method which may be used to evaluate this requirement.)

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30610, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30615 Personal protective equipment (PPE) program. A written personal protective equipment program, which is part of the employer's safety and health program required in WAC 296-62-3010 or 296-62-31405 and which must be part of the site-specific safety and health plan must be established. The PPE program must address the elements listed below. When elements, such as donning and doffing procedures, are provided by the manufacturer of a piece of equipment and are attached to the plan, they need not be rewritten into the plan as long as they adequately address the procedure or element.

- (1) PPE selection based on site hazards;
- (2) PPE use and limitations of the equipment;
- (3) Work mission duration;
- (4) PPE maintenance and storage;
- (5) PPE decontamination and disposal;
- (6) PPE training and proper fitting;
- (7) PPE donning and doffing procedures;
- (8) PPE inspection procedures prior to, during, and after use;
- (9) Evaluation of the effectiveness of the PPE program; and
- (10) Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

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[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30615, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3070 Monitoring concentrations of hazardous substances. (1) Monitoring must be performed in accordance with this section where there may be a question of employee exposure to concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices, and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits or published exposure levels if there are no permissible exposure limits, for hazardous substances.

(2) Air monitoring must be used to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of employee protection needed on site.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3070, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 90-20-091 (Order 90-14), § 296-62-3070, filed 10/1/90, effective 11/15/90; 89-21-018, § 296-62-3070, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3070, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30705 Monitoring during initial entry. Upon initial entry, representative air monitoring must be conducted to identify any IDLH condition, exposure over permissible exposure limits or published exposure levels, exposure over a radioactive material's dose limits, or other dangerous condition, such as the presence of flammable atmospheres or oxygen-deficient environments.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30705, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30710 Periodic monitoring. Periodic monitoring must be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it must be considered whether the possibility that exposures have risen are as follows:

- (1) When work begins on a different portion of the site.
- (2) When contaminants other than those previously identified are being handled.
- (3) When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling).
- (4) When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon).
- (5) When a sufficient reasonable interval has passed so that exposures may have significantly increased.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30710, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30715 Monitoring of high-risk employees. After the actual clean-up phase of any hazardous waste operation commences; for example, when soil, surface water, or containers are moved or disturbed; the employer must monitor those employees likely to have the highest exposures to hazardous substances and health hazards likely to be present above permissible exposure limits or published expo-

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sure levels by using personal sampling frequently enough to characterize employee exposures. If the employees likely to have the highest exposure are over permissible exposure limits or published exposure levels, then monitoring must continue to determine all employees likely to be above those limits. The employer may use a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated in this subsection.

Note: It is not required to monitor employees engaged in site characterization operations covered by WAC 296-62-3020 through 296-62-30235.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30715, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3080 Informational programs. Employers must develop and implement a program which is part of the employer's safety and health program required in WAC 296-62-3010 through 296-62-30145 to inform employees, contractors, and subcontractors (or their representative) actually engaged in hazardous waste operations of the nature, level, and degree of exposure likely as a result of participation in such hazardous waste operations. Employees, contractors, and subcontractors working outside of the operations part of a site are not covered by this standard.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3080, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 89-21-018, § 296-62-3080, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3080, filed 10/6/88, effective 11/7/88.]

WAC 296-62-3090 General requirements for handling drums and containers. (1) Hazardous substances and contaminated soils, liquids, and other residues must be handled, transported, labeled, and disposed of in accordance with this section.

(2) Drums and containers used during the clean-up must meet the appropriate DOT, OSHA, WISHA, and EPA regulations for the wastes that they contain.

(3) When practical, drums and containers must be inspected and their integrity must be assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions (i.e., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) must be moved to an accessible location and inspected prior to further handling.

(4) Unlabeled drums and containers must be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.

(5) Site operations must be organized to minimize the amount of drum or container movement.

(6) Prior to movement of drums or containers, all employees exposed to the transfer operation must be warned of the potential hazards associated with the contents of the drums or containers.

(7) United States Department of Transportation specified salvage drums or containers and suitable quantities of proper absorbent must be kept available and used in areas where spills, leaks, or ruptures may occur.

(8) Where major spills may occur, a spill containment program, which is part of the employer's safety and health

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program required in WAC 296-62-3010, must be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

(9) Drums and containers that cannot be moved without rupture, leakage, or spillage must be emptied into a sound container using a device classified for the material being transferred.

(10) A ground-penetrating system or other type of detection system or device must be used to estimate the location and depth of buried drums or containers.

(11) Soil or covering material must be removed with caution to prevent drum or container rupture.

(12) Fire extinguishing equipment meeting the requirements of Part G of chapter 296-24 WAC must on hand and ready for use to control incipient fires.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3090, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 93-19-142 (Order 93-04), § 296-62-3090, filed 9/22/93, effective 11/1/93; 91-11-070 (Order 91-01), § 296-62-3090, filed 5/20/91, effective 6/20/91; 89-21-018, § 296-62-3090, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3090, filed 10/6/88, effective 11/7/88.]

WAC 296-62-30905 Opening drums and containers. The following procedures must be followed in areas where drums or containers are being opened:

(1) Where an airline respirator system is used, connections to the source of air supply must be protected from contamination and the entire system must be protected from physical damage.

(2) Employees not actually involved in opening drums or containers must be kept a safe distance from the drums or containers being opened.

(3) If employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation must be placed between the employee and the drums or containers being opened to protect the employee in case of accidental explosion.

(4) Controls for drum or container opening equipment, monitoring equipment, and fire suppression equipment must be located behind the explosion-resistant barrier.

(5) When there is a reasonable possibility of flammable atmospheres being present, material handling equipment and hand tools must be of the type to prevent sources of ignition.

(6) Drums and containers must be opened in such a manner that excess interior pressure will be safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding must be placed between the employee and the drums or containers to reduce the risk of employee injury.

(7) Employees must not stand upon or work from drums or containers.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30905, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30910 Material handling equipment. Material handling equipment used to transfer drums and containers must be selected, positioned, and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30910, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30915 Radioactive wastes. Drums and containers containing radioactive wastes must not be handled until such time as their hazard to employees is properly assessed.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30915, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30920 Shock-sensitive wastes. As a minimum, the following special precautions must be taken when drums and containers containing or suspected of containing shock-sensitive wastes are handled:

(1) All nonessential employees must be evacuated from the area of transfer.

(2) Material handling equipment must be provided with explosive containment devices or protective shields to protect equipment operators from exploding containers.

(3) An employee alarm system capable of being perceived above surrounding light and noise conditions must be used to signal the commencement and completion of explosive waste handling activities.

(4) Continuous communications (i.e., portable radios, hand signals, telephones, as appropriate) must be maintained between the employee-in-charge of the immediate handling area and the site safety and health supervisor and command post until such time as the handling operation is completed. Communication equipment or methods that could cause shock-sensitive materials to explode must not be used.

(5) Drums and containers under pressure, as evidenced by bulging or swelling, must not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum.

(6) Drums and containers containing packaged laboratory wastes must be considered to contain shock-sensitive or explosive materials until they have been characterized.

Caution: Shipping of shock-sensitive wastes may be prohibited under United States Department of Transportation regulations. Employers and their shippers should refer to WAC 480-12-195.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30920, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30925 Laboratory waste packs. In addition to the requirements of WAC 296-62-30915, the following precautions must be taken, as a minimum, in handling laboratory waste packs (lab packs):

(1) Lab packs must be opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes.

(2) If crystalline material is noted on any container, the contents must be handled as a shock-sensitive waste until the contents are identified.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30925, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30930 Sampling of drum and container contents. Sampling of containers and drums must be done in accordance with a sampling procedure which is part of the

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site safety and health plan developed for and available to employees and others at the specific worksite.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30930, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30935 Shipping and transport of drums. (1) Drums and containers must be identified and classified prior to packaging for shipment.

(2) Drum or container staging areas must be kept to the minimum number necessary to identify and classify materials safely and prepare them for transport.

(3) Staging areas must be provided with adequate access and egress routes.

(4) Bulking of hazardous wastes must be permitted only after a thorough characterization of the materials has been completed.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30935, filed 3/23/99, effective 6/23/99.]

WAC 296-62-30940 Tanks and vaults procedures. (1) Tanks and vaults containing hazardous substances must be handled in a manner similar to that for drums and containers, taking into consideration the size of the tank or vault.

(2) Appropriate tank or vault entry procedures as described in chapter 296-62 WAC, Part M and the employer's safety and health plan must be followed whenever employees must enter a tank or vault.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-30940, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3100 Decontamination procedures. (1) General. Procedures for all phases of decontamination must be developed according to WAC 296-62-3100 through 296-62-31015.

(2) Decontamination procedures.

(a) A decontamination procedure must be developed, communicated to employees and implemented before any employees or equipment may enter areas on site where potential for exposure to hazardous substances exists.

(b) Standard operating procedures must be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.

(c) All employees leaving a contaminated area must be appropriately decontaminated; all contaminated clothing and equipment leaving a contaminated area must be appropriately disposed of or decontaminated.

(d) Decontamination procedures must be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps must be taken to correct any deficiencies.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3100, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 89-21-018, § 296-62-3100, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3100, filed 10/6/88, effective 11/7/88.]

WAC 296-62-31005 Location of decontamination areas. Decontamination must be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.

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[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31005, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31010 Decontamination of equipment and solvents. All equipment and solvents used for decontamination must be decontaminated or disposed of properly.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31010, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31015 Decontamination of personal protective clothing and equipment. (1) Protective clothing and equipment must be decontaminated, cleaned, laundered, maintained, or replaced as needed to maintain their effectiveness.

(2) Employees whose nonimpermeable clothing becomes wetted with hazardous substances must immediately remove that clothing and proceed to shower. The clothing must be disposed of or decontaminated before it is removed from the work zone.

(3) Unauthorized employees. Unauthorized employees must not remove protective clothing or equipment from change rooms.

(4) Commercial laundries or cleaning establishments. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment must be informed of the potentially harmful effects of exposures to hazardous substances.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31015, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31020 Showers and change rooms used for decontamination. Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they must be provided and meet the requirements of Part B-1 of chapter 296-24 WAC. If temperature conditions prevent the effective use of water, then other effective means for cleansing must be provided and used.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31020, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3110 Emergency response plan for employees at uncontrolled hazardous waste sites. (1) An emergency response plan must be developed and implemented by all employers within the scope of WAC 296-62-30001 (1)(a) and (b) to handle anticipated emergencies prior to the commencement of hazardous waste operations. The plan must be in writing and available for inspection and copying by employees, their representatives, WISHA personnel, and other governmental agencies with relevant responsibilities.

(2) Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency are exempt from the requirements of this section if they provide an emergency action plan complying with WAC 296-24-567(1).

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3110, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 90-20-091 (Order 90-14), § 296-62-3110, filed 10/1/90, effective 11/15/90; 90-09-

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026 (Order 90-01), § 296-62-3110, filed 4/10/90, effective 5/25/90; 89-21-018 (Order 89-10), § 296-62-3110, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3110, filed 10/6/88, effective 11/7/88.]

WAC 296-62-31105 Elements of an emergency response plan at uncontrolled hazardous waste sites. The employer must develop an emergency response plan for emergencies which must address as a minimum, the following:

- (1) Preemergency planning.
- (2) Personnel roles, lines of authority, and communication.
- (3) Emergency recognition and prevention.
- (4) Safe distances and places of refuge.
- (5) Site security and control.
- (6) Evacuation routes and procedures.
- (7) Decontamination procedures which are not covered by the site safety and health plan.
- (8) Emergency medical treatment and first aid.
- (9) Emergency alerting and response procedures.
- (10) Critique of response and follow-up.
- (11) PPE and emergency equipment.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31105, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31110 Procedures for handling emergency incidents at uncontrolled hazardous waste sites. (1) In addition to the elements for the emergency response plan required in WAC 296-62-31105, the following elements must be included for emergency response plans:

- (a) Site topography, layout, and prevailing weather conditions.
- (b) Procedures for reporting incidents to local, state, and federal governmental agencies.
- (2) The emergency response plan must be a separate section of the site safety and health plan.
- (3) The emergency response plan must be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.
- (4) The emergency response plan must be rehearsed regularly as part of the overall training program for site operations.

(5) The site emergency response plan must be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.

(6) An employee alarm system must be installed in accordance with WAC 296-24-631 through 296-24-63199 to notify employees of an on-site emergency situation, to stop work activities if necessary, to lower background noise in order to speed communication, and to begin emergency procedures.

(7) Based upon the information available at the time of the emergency, the employer must evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the on-site emergency response plan.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31110, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3120 Illumination. Areas accessible to employees must be lighted to not less than the minimum illu-

mination intensities listed in Table 1 while any work is in progress:

TABLE 1 - 120.1 — MINIMUM ILLUMINATION
Intensities in Foot-Candles

Foot-candles	Area or operation
5	General site area.
3	Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: Warehouses, corridors, hallways, and exitways.
5	Tunnels, shafts, and general underground work areas; exception: Minimum of ten foot-candles is required at tunnel and shaft heading during drilling, mucking, and scaling. Mine Safety and Health Administration and the National Institute for Occupational Safety and Health approved cap lights shall be acceptable for use in the tunnel heading.
10	General shops (e.g., mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms).
30	First aid stations, infirmaries, and offices.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3120, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-3120, filed 7/20/94, effective 9/20/94; 89-21-018, § 296-62-3120, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3120, filed 10/6/88, effective 11/7/88.]

WAC 296-62-3130 Sanitation at temporary workplaces.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3130, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 89-21-018, § 296-62-3130, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3130, filed 10/6/88, effective 11/7/88.]

WAC 296-62-31305 Potable water. (1) An adequate supply of potable water must be provided on the site.

(2) Portable containers used to dispense drinking water must be capable of being tightly closed, and equipped with a tap. Water must not be dipped from containers.

(3) Any container used to distribute drinking water must be clearly marked as to the nature of its contents and not used for any other purpose.

(4) Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups must be provided.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31305, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31310 Nonpotable water. (1) Outlets for nonpotable water, such as water for fire fighting purposes must be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.

(2) There must be no cross-connection, open or potential, between a system furnishing potable water and a system furnishing nonpotable water.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31310, filed 3/23/99, effective 6/23/99.]

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WAC 296-62-31315 Toilet facilities. (1) Toilets must be provided for employees according to Table 2.

TABLE 2 — TOILET FACILITIES

Number of employees	Minimum number of facilities
20 or fewer	One.
More than 20, fewer than 200	One toilet seat and one urinal per 40 employees.
More than 200	One toilet seat and one urinal per 50 employees.

(2) Under temporary field conditions, provisions must be made to assure that at least one toilet facility is available.

(3) Hazardous waste sites, not provided with a sanitary sewer must be provided with the following toilet facilities unless prohibited by local codes:

- Chemical toilets;
- Recirculating toilets;
- Combustion toilets; or
- Flush toilets.

(4) The requirements of this section for sanitation facilities must not apply to mobile crews having transportation readily available to nearby toilet facilities.

(5) Doors entering toilet facilities must be provided with entrance locks controlled from inside the facility.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31315, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31320 Food handling. All food service facilities and operations for employees must meet the applicable laws, ordinances, and regulations of the jurisdictions in which they are located.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31320, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31325 Temporary sleeping quarters. When temporary sleeping quarters are provided, they must be heated, ventilated, and lighted.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31325, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31330 Washing facilities. The employer must provide adequate washing facilities for employees engaged in operations where hazardous substances may be harmful to employees. Such facilities must be in near proximity to the worksite, in areas where exposures are below permissible exposure limits and published exposure levels and which are under the controls of the employer, and must be so equipped as to enable employees to remove hazardous substances from themselves.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31330, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31335 Showers and change rooms. When hazardous waste clean-up or removal operations commence on a site and the duration of the work will require six months or greater time to complete, the employer must provide showers and change rooms for all employees exposed to hazardous substances and health hazards involved in hazardous waste clean-up or removal operations.

(1) Showers must be provided and must meet the requirements of WAC 296-24-12009(3).

(2) Change rooms must be provided and must meet the requirements of WAC 296-24-12011. Change rooms must consist of two separate change areas separated by the shower area required in (1) of this subsection. One change area, with an exit leading off the worksite, must provide employees with a clean area where they can remove, store, and put on street clothing. The second area, with an exit to the worksite, must provide employees with an area where they can put on, remove and store work clothing and personal protective equipment.

(3) Showers and change rooms must be located in areas where exposures are below the permissible exposure limits and published exposure levels. If this cannot be accomplished, then a ventilation system must be provided that will supply air that is below the permissible exposure limits and published exposure levels.

(4) Employers must assure that employees shower at the end of their work shift and when leaving the hazardous waste site.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31335, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3138 New technology programs. (1)

The employer must develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations, and the same must be implemented as part of the site safety and health program to assure that employee protection is being maintained.

(2) New technologies, equipment or control measures available to the industry, such as the use of foams, absorbents, adsorbents, neutralizers, or other means to suppress the level of air contaminants while excavating the site or for spill control, must be evaluated by employers or their representatives. Such an evaluation must be done to determine the effectiveness of the new methods, materials, or equipment before implementing their use on a large scale for enhancing employee protection. Information and data from manufacturers or suppliers may be used as part of the employer's evaluation effort. Such evaluations must be made available to WISHA upon request.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3138, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 89-21-018, § 296-62-3138, filed 10/10/89, effective 11/24/89.]

WAC 296-62-3140 Certain operations conducted under the Resource Conservation and Recovery Act of 1976 (RCRA). Employers conducting operations at treatment, storage, and disposal (TSD) facilities specified in WAC 296-62-30001 (1)(d) must provide and implement the programs specified in WAC 296-62-3140 through 296-62-31470. See the "Notes and Exceptions" of WAC 296-62-30001 (2)(c) for employers not covered.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3140, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 94-16-145, § 296-62-3140, filed 8/3/94, effective 9/12/94; 91-24-017 (Order 91-07), § 296-62-3140, filed 11/22/91, effective 12/24/91; 90-20-091 (Order 90-14), § 296-62-3140, filed 10/1/90, effective 11/15/90; 89-21-018, § 296-62-

3140, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3140, filed 10/6/88, effective 11/7/88.]

WAC 296-62-31405 Safety and health program under RCRA. The employer must develop and implement a written safety and health program for employees involved in hazardous waste operations that must be available for inspection by employees, their representatives and WISHA personnel. The program shall be designed to identify, evaluate and control safety and health hazards in their facilities for the purpose of employee protection, to provide for emergency response meeting the requirements of WAC 296-62-3110 and to address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures and uses of new technologies.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31405, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31410 Hazard communication program requirements under RCRA. The employer must implement a hazard communication program meeting the requirements of chapter 296-62 WAC, Part C, as part of the employer's safety and health program.

Note: The exemption for hazardous waste provided in WAC 296-62-054 is applicable to this section.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31410, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31415 Medical surveillance program requirements under RCRA. The employer must develop and implement a medical surveillance program meeting the requirements of WAC 296-62-3050.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31415, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31420 Decontamination program requirements under RCRA. The employer must develop and implement a decontamination procedure meeting the requirements of WAC 296-62-3100 through 296-62-31015.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31420, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31425 New technology programs requirements under RCRA. The employer must develop and implement procedures meeting the requirements of WAC 296-62-3138 for introducing new and innovative equipment into the workplace.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31425, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31430 Material handling program requirements under RCRA. Where employees will be handling drums or containers, the employer must develop and implement procedures meeting the requirements of WAC 296-62-3090 (2) through (8), as well as WAC 296-62-30910 and 296-62-30935, prior to starting such work.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31430, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31435 Training program for new employees under RCRA. The employer must develop and implement a training program, which is part of the employer's safety and health program, for employees exposed to health hazards or hazardous substances at TSD operations to enable the employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees. The initial training must be for 24 hours and refresher training must be for eight hours annually. Employees who have received the initial training required by this section shall be given a written certificate attesting that they have successfully completed the necessary training.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31435, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31440 Training program for current employees. Employers who can show by an employee's previous work experience and/or training that the employee has had training equivalent to the initial training required by this section, must be considered as meeting the initial training requirements of this section as to that employee. Equivalent training includes the training that existing employees might have already received from actual site work experience. Current employees must receive eight hours of refresher training annually.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31440, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31445 RCRA requirements for trainers. Trainers who teach initial training must have satisfactorily completed a training course for teaching the subjects they are expected to teach or they must have the academic credentials and instruction experience necessary to demonstrate a good command of the subject matter of the courses and competent instructional skills.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31445, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31450 Emergency response program requirements under RCRA.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31450, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31455 Emergency response plan under RCRA. An emergency response plan must be developed and implemented by all employers. The plan does not need to duplicate any of the subjects fully addressed in the employer's contingency planning required by permits, such as those issued by the United States Environmental Protection Agency, provided that the contingency plan is made part of the emergency response plan. The emergency response plan must be a written portion of the employer's safety and health program. Employers who will evacuate their employees from the worksite location when an emergency occurs and who do not permit any of their employees to assist in handling the emergency are exempt from the requirements of WAC 296-62-31450 through 296-62-31470 if they provide an emergency action plan meeting the requirements in WAC 296-24-567.

[Title 296 WAC—p. 1836]

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31455, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31460 Elements of an emergency response plan under RCRA. The employer must develop an emergency response plan for emergencies. The plan must address the following areas to the extent that they are not addressed in any specific program required in this part:

- (1) Preemergency planning and coordination with outside parties.
- (2) Personnel roles, lines of authority, and communication.
- (3) Emergency recognition and prevention.
- (4) Safe distances and places of refuge.
- (5) Site security and control.
- (6) Evacuation routes and procedures.
- (7) Decontamination procedures.
- (8) Emergency medical treatment and first aid.
- (9) Emergency alerting and response procedures.
- (10) Critique of response and follow-up.
- (11) PPE and emergency equipment.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-31460, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31465 Training requirements for emergency response under RCRA. (1) Training for emergency response employees must be completed before they are called upon to perform in real emergencies. The training must cover the elements of the emergency response plan, standard operating procedures the employer has established for the job, the personal protective equipment to be worn, and procedures for handling emergency incidents.

Exception #1: An employer need not train all employees to the degree specified if the employer divides the workforce in a manner such that a sufficient number of employees who have responsibility to control emergencies have the training specified, and all other employees, who may first respond to an emergency incident, have sufficient awareness training to recognize that an emergency response situation exists and that they are instructed in that case to summon the fully trained employees and not attempt to control activities for which they are not trained.

Exception #2: An employer need not train all employees to the degree specified if arrangements have been made in advance for an outside fully trained emergency response team to respond in a reasonable period and all employees, who may come to the incident first, have sufficient awareness training to recognize that an emergency response situation exists and they have been instructed to call the designated outside fully trained emergency response team for assistance.

(2) Employee members of TSD facility emergency response organizations must be trained to a level of competence in the recognition of health and safety hazards to protect themselves and other employees. This would include training in the methods used to minimize the risk from safety and health hazards; in the safe use of control equipment; in the selection and use of appropriate personal protective equipment; in the safe operating procedures to be used at the incident scene; in the techniques of coordination with other employees to minimize risks; in the appropriate response to overexposure from health hazards or injury to themselves and other employees; and in the recognition of subsequent symptoms which may result from overexposures.

(3) The employer must certify that each covered employee has attended and successfully completed the training required in this subsection, or must certify the employee's competency at least yearly. The method used to demonstrate competency for certification of training must be recorded and maintained by the employer.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-31465, filed 3/23/99, effective 6/23/99.]

WAC 296-62-31470 Procedures for handling emergency incidents under RCRA. (1) In addition to the elements for the emergency response plan required in WAC 296-62-31460, the following elements must be included for emergency response plans to the extent that they do not repeat any information already contained in the emergency response plan:

(a) Site topography, layout, and prevailing weather conditions.

(b) Procedures for reporting incidents to local, state, and federal governmental agencies.

(2) The emergency response plan must be compatible and integrated with the disaster, fire, and/or emergency response plans of local, state, and federal agencies.

(3) The emergency response plan must be rehearsed regularly as part of the overall training program for site operations.

(4) The site emergency response plan must be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.

(5) An employee alarm system must be installed in accordance with WAC 296-24-631 to notify employees of an emergency situation; to stop work activities if necessary; to lower background noise in order to speed communication; and to begin emergency procedures.

(6) Based upon the information available at time of the emergency, the employer must evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-31470, filed 3/23/99, effective 6/23/99.]

WAC 296-62-3152 Appendices to Part P—Hazardous waste operations and TSD facilities.

Note: The following appendices serve as nonmandatory guidelines to assist employees and employers in complying with the appropriate requirements of this part. However, WAC 296-62-3060 through 296-62-30615 makes mandatory in certain circumstances the use of Level A and Level B personal protective equipment protection.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-3152, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW, 89-21-018, § 296-62-3152, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3152, filed 10/6/88, effective 11/7/88.]

WAC 296-62-3160 Appendix A—Personal protective equipment test methods. This appendix sets forth the nonmandatory examples of tests which may be used to evaluate compliance with WAC 296-62-3060. Other tests and other challenge agents may be used to evaluate compliance.

(1) Totally-encapsulating chemical protective suit pressure test.

(2001 Ed.)

(a) Scope.

(i) This practice measures the ability of a gas tight totally-encapsulating chemical protective suit material, seams, and closures to maintain a fixed positive pressure. The results of this practice allow the gas tight integrity of a total-encapsulating chemical protective suit to be evaluated.

(ii) Resistance of the suit materials to permeation, penetration, and degradation by specific hazardous substances is not determined by this test method.

(b) Definition of terms.

(i) "Totally-encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.

(ii) "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

(iii) "Gas tight" means for the purpose of this test method the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

(c) Summary of test method. The TECP suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pretest suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes. If the pressure drop is excessive, the TECP suit fails the test and is removed from service. The test is repeated after leak location and repair.

(d) Required supplies.

(i) Source of compressed air.

(ii) Test apparatus for suit testing including a pressure measurement device with a sensitivity of at least 1/4 inch water gauge.

(iii) Vent valve closure plugs or sealing tape.

(iv) Soapy water solution and soft brush.

(v) Stopwatch or appropriate timing device.

(e) Safety precautions. Care must be taken to provide the correct pressure safety devices required for the source of compressed air used.

(f) Test procedure. Prior to each test, the tester must perform a visual inspection of the suit. Check the suit for seam integrity by visually examining the seams and gently pulling on the seams. Ensure that all air supply lines, fittings, visor, zippers, and valves are secure and show no signs of deterioration.

(i) Seal off the vent valves along with any other normal inlet or exhaust points (such as umbilical air line fittings or facepiece opening) with tape or other appropriate means (caps, plugs, fixture, etc.). Care should be exercised in the sealing process not to damage any of the suit components.

(ii) Close all closure assemblies.

(iii) Prepare the suit for inflation by providing an improvised connection point on the suit for connecting an airline. Attach the pressure test apparatus to the suit to permit suit inflation from a compressed air source equipped with a pres-

sure indicating regulator. The leak tightness of the pressure test apparatus should be tested before and after each test by closing off the end of the tubing attached to the suit and assuring a pressure of three inches water gauge for three minutes can be maintained. If a component is removed for the test, that component must be replaced and a second test conducted with another component removed to permit a complete test of the ensemble.

(iv) The pretest expansion pressure (A) and the suit test pressure (B) must be supplied by the suit manufacturer, but in no case shall they be less than (A) = 3 inches water gauge and (B) = 2 inches water gauge. The ending suit pressure (C) must be no less than eighty percent of the test pressure (B); i.e., the pressure drop shall not exceed twenty percent of the test pressure (B).

(v) Inflate the suit until the pressure inside is equal to pressure (A), the pretest expansion suit pressure. Allow at least one minute to fill out the wrinkles in the suit. Release sufficient air to reduce the suit pressure to pressure (B), the suit test pressure. Begin timing. At the end of three minutes, record the suit pressure as pressure (C), the ending suit pressure. The difference between the suit test pressure and the ending suit test pressure (B)-(C) must be defined as the suit pressure drop.

(vi) If the suit pressure drop is more than twenty percent of the suit test pressure (B) during the three minute test period, the suit fails the test and must be removed from service.

(g) Retest procedure.

(i) If the suit fails the test check for leaks by inflating the suit to pressure (A) and brushing or wiping the entire suit (including seams, closures, lens gaskets, glove-to-sleeve joints, etc.) with a mild soap and water solution. Observe the suit for the formation of soap bubbles, which is an indication of a leak. Repair all identified leaks.

(ii) Retest the TECP suit as outlined in (f) of this subsection.

(h) Report. Each TECP suit tested by this practice must have the following information recorded.

(i) Unique identification number, identifying brand name, date of purchase, material of construction, and unique fit features; e.g., special breathing apparatus.

(ii) The actual values for test pressures (A), (B), and (C) must be recorded along with the specific observation times. If the ending pressure (C) is less than eighty percent of the test pressure (B), the suit must be identified as failing the test. When possible, the specific leak location must be identified in the test records. Retest pressure data must be recorded as an additional test.

(iii) The source of the test apparatus used must be identified and the sensitivity of the pressure gauge must be recorded.

(iv) Records must be kept for each pressure test even if repairs are being made at the test location.

Caution. Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked. Care should also be exercised to assure that the inside and

outside of the suit is completely dry before it is put into storage.

(2) Totally-encapsulating chemical protective suit qualitative leak test.

(a) Scope.

(i) This practice semiquantitatively tests gas tight totally-encapsulating chemical protective suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit.

(ii) Resistance of the suit materials to permeation, penetration, and degradation is not determined by this test method. ASTM test methods are available to test suit materials for those characteristics and the tests are usually conducted by the manufacturers of the suits.

(b) Definition of terms.

(i) "Totally-encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.

(ii) "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

(iii) "Gas tight" means for the purpose of this test method the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

(iv) "Intrusion coefficient." A number expressing the level of protection provided by a gas tight totally-encapsulating chemical protective suit. The intrusion coefficient is calculated by dividing the test room challenge agent concentration by the concentration of challenge agent found inside the suit. The accuracy of the intrusion coefficient is dependent on the challenge agent monitoring methods. The larger the intrusion coefficient, the greater the protection provided by the TECP suit.

(c) Summary of recommended practice. The volume of concentrated aqueous ammonia solution (ammonia hydroxide, NH_4OH) required to generate the test atmosphere is determined using the directions outlined in WAC 296-62-3160 (2)(f)(i). The suit is donned by a person wearing the appropriate respiratory equipment (either a positive pressure self-contained breathing apparatus or a supplied air respirator) and worn inside the enclosed test room. The concentrated aqueous ammonia solution is taken by the suited individual into the test room and poured into an open plastic pan. A two-minute evaporation period is observed before the test room concentration is measured using a high range ammonia length of stain detector tube. When the ammonia reaches a concentration of between 1000 and 1200 ppm, the suited individual starts a standardized exercise protocol to stress and flex the suit. After this protocol is completed the test room concentration is measured again. The suited individual exits the test room and his stand-by person measures the ammonia concentration inside the suit using a low range ammonia

length of stain detector tube or other more sensitive ammonia detector. A stand-by person is required to observe the test individual during the test procedure, aid the person in donning and doffing the TECP suit and monitor the suit interior. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration. A colorimetric indicator strip of bromophenol blue is placed on the inside of the suit facepiece lens so that the suited individual is able to detect a color change and know if the suit has a significant leak. If a color change is observed the individual should leave the test room immediately.

(d) Required supplies.

(i) A supply of concentrated aqueous ammonium hydroxide, 58% by weight.

(ii) A supply of bromophenol/blue indicating paper, sensitive to 5-10 ppm ammonia or greater over a two-minute period of exposure [pH 3.0 (yellow) to pH 4.6 (blue)].

(iii) A supply of high range (0.5-10 volume percent) and low range (5-700 ppm) detector tubes for ammonia and the corresponding sampling pump. More sensitive ammonia detectors can be substituted for the low range detector tubes to improve the sensitivity of this practice.

(iv) A shallow plastic pan (PVC) at least 12":14":1" and a half pint plastic container (PVC) with tightly closing lid.

(v) A graduated cylinder or other volumetric measuring device of at least fifty milliliters in volume with an accuracy of at least ± 1 milliliters.

(e) Safety precautions.

(i) Concentrated aqueous ammonium hydroxide, NH_4OH is a corrosive volatile liquid requiring eye, skin, and respiratory protection. The person conducting the test must review the MSDS for aqueous ammonia.

(ii) Since the established permissible exposure limit for ammonia is 35 ppm as a 15 minute STEL, only persons wearing a positive pressure self-contained breathing apparatus or a supplied air respirator must be in the chamber. Normally only the person wearing the total-encapsulating suit will be inside the chamber. A stand-by person must have a self-contained breathing apparatus, or a positive pressure supplied air respirator available to enter the test area should the suited individual need assistance.

(iii) A method to monitor the suited individual must be used during this test. Visual contact is the simplest but other methods using communication devices are acceptable.

(iv) The test room must be large enough to allow the exercise protocol to be carried out and then to be ventilated to allow for easy exhaust of the ammonia test atmosphere after the test(s) are completed.

(v) Individuals must be medically screened for the use of respiratory protection and checked for allergies to ammonia before participating in this test procedure.

(f) Test procedure.

(i) Measure the test area to the nearest foot and calculate its volume in cubic feet. Multiply the test area volume by 0.2 milliliters of concentrated aqueous ammonia per cubic foot of test area volume to determine the approximate volume of concentrated aqueous ammonia required to generate 1000 ppm in the test area.

(A) Measure this volume from the supply of concentrated ammonia and place it into a closed plastic container.

(B) Place the container, several high range ammonia detector tubes and the pump in the clean test pan and locate it near the test area entry door so that the suited individual has easy access to these supplies.

(ii) In a noncontaminated atmosphere, open a presealed ammonia indicator strip and fasten one end of the strip to the inside of the suit face shield lens where it can be seen by the wearer. Moisten the indicator strip with distilled water. Care must be taken not to contaminate the detector part of the indicator paper by touching it. A small piece of masking tape or equivalent should be used to attach the indicator strip to the interior of the suit face shield.

(iii) If problems are encountered with this method of attachment the indicator strip can be attached to the outside of the respirator facepiece being used during the test.

(iv) Don the respiratory protective device normally used with the suit, and then don the TECP suit to be tested. Check to be sure all openings which are intended to be sealed (zippers, gloves, etc.) are completely sealed. DO NOT, however, plug off any venting valves.

(v) Step into the enclosed test room such as a closet, bathroom, or test booth, equipped with an exhaust fan. No air should be exhausted from the chamber during the test because this will dilute the ammonia challenge concentrations.

(vi) Open the container with the premeasured volume of concentrated aqueous ammonia within the enclosed test room, and pour the liquid into the empty plastic test pan. Wait two minutes to allow for adequate volatilization of the concentrated aqueous ammonia. A small mixing fan can be used near the evaporation pan to increase the evaporation rate of the ammonia solution.

(vii) After two minutes a determination of the ammonia concentration within the chamber should be made using the high range colorimetric detector tube. A concentration of 1000 ppm ammonia or greater must be generated before the exercises are started.

(viii) To test the integrity of the suit the following four minute exercise protocol should be followed:

(A) Raising the arms above the head with at least fifteen raising motions completed in one minute.

(B) Walking in place for one minute with at least fifteen raising motions of each leg in a one-minute period.

(C) Touching the toes with at least ten complete motions of the arms from above the head to touching of the toes in a one-minute period.

(D) Knee bends with at least ten complete standing and squatting motions in a one-minute period.

(ix) If at any time during the test the colorimetric indicating paper should change colors the test should be stopped and (f)(x) and (xi) of this subsection initiated.

(x) After completion of the test exercise, the test area concentration should be measured again using the high range colorimetric detector tube.

(xi) Exit the test area.

(xii) The opening created by the suit zipper or other appropriate suit penetration should be used to determine the ammonia concentration in the suit with the low range length

of stain detector tube or other ammonia monitor. The internal TECP suit air should be sampled far enough from the enclosed test area to prevent a false ammonia reading.

(xiii) After completion of the measurement of the suit interior ammonia concentration the test is concluded and the suit is doffed and the respirator removed.

(xiv) The ventilating fan for the test room should be turned on and allowed to run for enough time to remove the ammonia gas. The fan must be vented to the outside of the building.

(xv) Any detectable ammonia in the suit interior (5 ppm ammonia (NH₃) or more for the length of stain detector tube) indicates the suit failed the test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass/fail criteria.

(xvi) By following this test method an intrusion coefficient of approximately two hundred or more can be measured with the suit in a completely operational condition. If the intrusion coefficient is 200 or more, then the suit is suitable for emergency response and field use.

(g) Retest procedures.

(i) If the suit fails this test, check for leaks by following the pressure test in test (A) above.

(ii) Retest the TECP suit as outlined in the test procedure in (f) of this subsection.

(h) Report.

(i) Each gas tight totally-encapsulating chemical protective suit tested by this practice must have the following information recorded.

(A) Unique identification number, identifying brand name, date of purchase, material of construction, and unique suit features; e.g., special breathing apparatus.

(B) General description of test room used for test.

(C) Brand name and purchase date of ammonia detector strips and color change data.

(D) Brand name, sampling range, and expiration date of the length of stain ammonia detector tubes. The brand name and model of the sampling pump should also be recorded. If another type of ammonia detector is used, it should be identified along with its minimum detection limit for ammonia.

(E) Actual test results must list the two test area concentrations, their average, the interior suit concentration, and the calculated intrusion coefficient. Retest data must be recorded as an additional test.

(ii) The evaluation of the data must be specified as "suit passed" or "suit failed" and the date of the test. Any detectable ammonia (5 ppm or greater for the length of stain detector tube) in the suit interior indicates the suit fails this test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass/fail criteria.

Caution. Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-3160, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 91-24-

017 (Order 91-07), § 296-62-3160, filed 11/22/91, effective 12/24/91; 90-20-091 (Order 90-14), § 296-62-3160, filed 10/1/90, effective 11/15/90; 89-21-018, § 296-62-3160, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3160, filed 10/6/88, effective 11/7/88.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-62-3170 Appendix B—General description and discussion of the levels of protection and protective gear. (1) This appendix sets forth information about personal protective equipment (PPE) protection levels which may be used to assist employers in complying with the PPE requirements of this section.

(2) As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work on-site.

(3) Selection of the appropriate PPE is a complex process which must take into consideration a variety of factors. Key factors involved in this process are identification of the hazards or suspected hazards, their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact), and the performance of the PPE materials (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations.

(4) Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, must be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

(5) The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to up-grade or down-grade the level of PPE protection to match the tasks at hand.

(6) The following are guidelines which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation and reselection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

(7) Personal protective equipment has been divided into four categories based on the degree of protection afforded

(see subsection (8) of this section for further explanation of Levels A, B, C, and D hazards):

(a) Level A. To be selected when the greatest level of skin, respiratory, and eye protection is required. The following constitute Level A equipment; it may be used as appropriate:

- (i) Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied-air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
- (ii) Totally-encapsulating chemical-protective suit.
- (iii) Coveralls.*
- (iv) Long underwear.*
- (v) Gloves, outer, chemical-resistant.
- (vi) Gloves, inner, chemical-resistant.
- (vii) Boots, chemical-resistant steel toe and shank.
- (viii) Hard hat (under suit).*
- (ix) Disposable protective suit, gloves, and boots. (Depending on suit construction, may be worn over totally-encapsulating suit.)

*Optional, as applicable.

(b) Level B. The highest level of respiratory protection is necessary but a lesser level of skin protection is needed. The following constitute Level B equipment; it may be used as appropriate:

- (i) Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied-air respirator with escape SCBA (NIOSH approved).
- (ii) Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one or two-piece chemical-splash suit, disposable chemical-resistant overalls).
- (iii) Coveralls.*
- (iv) Gloves, outer, chemical-resistant.
- (v) Gloves, inner, chemical-resistant.
- (vi) Boots, outer, chemical-resistant steel toe and shank.
- (vii) Boot-covers, outer, chemical-resistant (disposable).*
- (viii) Hard hat.
- (ix) Face shield.*

*Optional, as applicable.

(c) Level C. The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met. The following constitute Level C equipment; it may be used as appropriate.

- (i) Full-face or half-mask, air purifying respirators (NIOSH approved).
- (ii) Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
- (iii) Coveralls.*
- (iv) Gloves, outer, chemical-resistant.
- (v) Gloves, inner, chemical-resistant.
- (vi) Boots (outer), chemical-resistant steel toe and shank.*
- (vii) Boot-covers, outer, chemical-resistant (disposable).*
- (viii) Hard hat.
- (ix) Escape mask.*
- (x) Face shield.*

(2001 Ed.)

*Optional, as applicable.

(d) Level D. A work uniform affording minimal protection: Used for nuisance contamination only. The following constitute Level D equipment; it may be used as appropriate.

- (i) Coveralls.
- (ii) Gloves.*
- (iii) Boots/shoes, chemical-resistant steel toe and shank.
- (iv) Boots, outer, chemical-resistant (disposable).*
- (v) Safety glasses or chemical splash goggles.*
- (vi) Hard hat.
- (vii) Escape mask.*
- (viii) Face shield.*

*Optional, as applicable.

(8) Part B. The types of hazards for which Levels A, B, C, and D protection are appropriate are described below:

(a) Level A - Level A protection should be used when:

(i) The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin;

(ii) Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or

(iii) Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

(b) Level B protection should be used when:

(i) The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;

(ii) The atmosphere contains less than 19.5 percent oxygen; or

(iii) The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

(c) Level C protection should be used when:

(i) The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;

(ii) The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and

(iii) All criteria for the use of air-purifying respirators are met.

(d) Level D protection should be used when:

(i) The atmosphere contains no known hazard; and

(ii) Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note: As stated before combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

(9) As an aid in selecting suitable chemical protective clothing, it should be noted that the National Fire Protection Association (NFPA) has developed standards on chemical protective clothing. The standards that have been adopted include:

(a) NFPA 1991 - Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing);

(b) NFPA 1992 - Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing);

(c) NFPA 1993 - Standard on Liquid Splash-Protective Suits for Nonemergency, Nonflammable Hazardous Chemical Situations (EPA Level B Protective Clothing).

(10) These standards apply documentation and performance requirements to the manufacture of chemical protective suits. Chemical protective suits meeting these requirements are labelled as compliant with the appropriate standard. It is recommended that chemical protective suits that meet these standards be used.

[Statutory Authority: Chapter 49.17 RCW. 95-04-006, § 296-62-3170, filed 1/18/95, effective 3/10/95; 90-20-091 (Order 90-14), § 296-62-3170, filed 10/1/90, effective 11/15/90; 89-21-018, § 296-62-3170, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3170, filed 10/6/88, effective 11/7/88.]

WAC 296-62-3180 Appendix C—Compliance guidelines. (1) Occupational safety and health program. Each hazardous waste site clean-up effort will require an occupational safety and health program headed by the site coordinator or the employer's representative. The purpose of the program will be the protection of employees at the site and will be an extension of the employer's overall safety and health program. The program will need to be developed before work begins on the site and implemented as work proceeds as stated in WAC 296-62-3010 through 296-62-30145. The program is to facilitate coordination and communication of safety and health issues among personnel responsible for the various activities which will take place at the site. It will provide the overall means for planning and implementing the needed safety and health training and job orientation of employees who will be working at the site. The program will provide the means for identifying and controlling worksite hazards and the means for monitoring program effectiveness. The program will need to cover the responsibilities and authority of the site coordinator or the employer's manager on the site for the safety and health of employees at the site, and the relationships with contractors or support services as to what each employer's safety and health responsibilities are for their employees on the site. Each contractor on the site needs to have its own safety and health program so structured that it will smoothly interface with the program of the site coordinator or principal contractor. Also those employers

involved with treating, storing, or disposal of hazardous waste as covered in WAC 296-62-3140 must have implemented a safety and health plan for their employees. This program is to include the hazard communication program required in WAC 296-62-31405 and the training required in WAC 296-62-31420 and 296-62-31425 as parts of the employers comprehensive overall safety and health program. This program is to be in writing.

(a) Each site or workplace safety and health program will need to include the following:

(i) Policy statements of the line of authority and accountability for implementing the program, the objectives of the program and the role of the site safety and health officer or manager and staff;

(ii) Means or methods for the development of procedures for identifying and controlling workplace hazards at the site;

(iii) Means or methods for the development and communication to employees of the various plans, work rules, standard operating procedures and practices that pertain to individual employees and supervisors;

(iv) Means for the training of supervisors and employees to develop the needed skills and knowledge to perform their work in a safe and healthful manner;

(v) Means to anticipate and prepare for emergency situations; and

(vi) Means for obtaining information feedback to aid in evaluating the program and for improving the effectiveness of the program. The management and employees should be trying continually to improve the effectiveness of the program thereby enhancing the protection being afforded those working on the site.

(b) Accidents on the site should be investigated to provide information on how such occurrences can be avoided in the future. When injuries or illnesses occur on the site or workplace, they will need to be investigated to determine what needs to be done to prevent this incident from occurring again. Such information will need to be used as feedback on the effectiveness of the program and the information turned into positive steps to prevent any reoccurrence. Receipt of employee suggestions or complaints relating to safety and health issues involved with site or workplace activities is also a feedback mechanism that can be used effectively to improve the program and may serve in part as an evaluative tool(s).

(c) For the development and implementation of the program to be the most effective, professional safety and health personnel should be used. Certified safety professionals, board-certified industrial hygienists, or registered professional safety engineers are good examples of professional stature for safety and health managers who will administer the employer's program.

(2) The training programs for employees subject to the requirements of WAC 296-62-3040 through 296-62-30465 are expected to address: The safety and health hazards employees should expect to find on sites; what control measures or techniques are effective for those hazards; what monitoring procedures are effective in characterizing exposure levels; what makes an effective employer's safety and health program; what a site safety and health plan should include; hands-on training with personal protective equipment and

clothing they may be expected to use; the contents of the WISHA standard relevant to the employee's duties and functions; and, employee's responsibilities under WISHA and other regulations. Supervisors will need training in their responsibilities under the safety and health program and its subject areas such as the spill containment program, the personal protective equipment program, the medical surveillance program, the emergency response plan and other areas.

(a) The training programs for employees subject to the requirements of WAC 296-62-3140 through 296-62-31465 should address: The employer's safety and health program elements impacting employees; the hazard communication program; the medical surveillance program; the hazards and the controls for such hazards that employees need to know for their job duties and functions. All require annual refresher training.

(b) The training programs for employees covered by the requirements of WAC 296-62-31110 will address those competencies required for the various levels of response such as: The hazards associated with hazardous substances; hazard identification and awareness; notification of appropriate persons; the need for and use of personal protective equipment including respirators; the decontamination procedures to be used; preplanning activities for hazardous substance incidents including the emergency response plan; company standard operating procedures for hazardous substance emergency responses; the use of the incident command system and other subjects. Hands-on training should be stressed whenever possible. Critiques done after an incident which include any evaluation of what worked, and what did not, and how can we do better the next time, may be counted as training time.

(3) Decontamination. Decontamination procedures will be tailored to the specific hazards of the site and will vary in complexity, and number of steps, depending on the level of hazard and the employee's exposure to the hazard. Decontamination procedures and PPE decontamination methods will vary depending upon the specific substance, since one procedure or method will not work for all substances. Evaluation of decontamination methods and procedures should be performed, as necessary, to assure that employees are not exposed to hazards by reusing PPE. References in WAC 296-62-3190, Appendix D, may be used for guidance in establishing an effective decontamination program. In addition, the United States Coast Guard Manual, "Policy Guidance for Response to Hazardous Chemical Releases," United States Department of Transportation, Washington, D.C. (COMDTINST M16465.30), is a good reference for establishing an effective decontamination program.

(4) Emergency response plans. States, along with designated districts within the states, will be developing or have developed emergency response plans. These state and district plans are to be used in the emergency response plans called for in this standard. Each employer needs to assure that its emergency response plan is compatible with the local plan. The major reference being used to aid in developing the state and local district plans is the Hazardous Materials Emergency Planning Guide, NRT-1. The current Emergency Response Guidebook from the United States Department of Transportation, CMA's CHEMTREC and the Fire Service

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Emergency Management Handbook may also be used as resources.

Employers involved with treatment, storage, and disposal facilities for hazardous waste, which have the required contingency plan called for by their permit, would not need to duplicate the same planning elements. Those items of the emergency response plan that are properly addressed in the contingency plan may be substituted into the emergency response plan required in WAC 296-62-410, Part R, Emergency response to hazardous substance release or otherwise kept together for employer and employee use.

(5) Personal protective equipment programs. The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biologic hazards that may be encountered at a hazardous substance site.

(a) As discussed in Appendix B, no single combination of protective equipment and clothing is capable of protecting against all hazards. Thus PPE should be used in conjunction with other protective methods and its effectiveness evaluated periodically.

(b) The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication. For any given situation, equipment and clothing will be selected that provide an adequate level of protection. However, over-protection, as well as under-protection, can be hazardous and should be avoided where possible.

(c) Two basic objectives of any PPE program will be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To accomplish these goals, a comprehensive PPE program will include hazard identification, medical monitoring, environmental surveillance, selection, use, maintenance, and decontamination of PPE and its associated training.

(d) The written PPE program will include policy statements, procedures, and guidelines. Copies will be made available to all employees and a reference copy will be made available at the worksite. Technical data on equipment, maintenance manuals, relevant regulations, and other essential information will also be collected and maintained.

(6) Medical surveillance programs.

(a) Workers handling hazardous substances may be exposed to toxic chemicals, safety hazards, biologic hazards, and radiation. Therefore, a medical surveillance program is essential to assess and monitor workers' health and fitness for employment in hazardous waste operations and during the course of work; to provide emergency and other treatment as needed; and to keep accurate records for future reference.

(b) *The Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), the United States Coast Guard (USCG), and the Environmental Protection Agency (EPA); October 1985 provides an excellent example of the types of medical testing that should be done as part of a medical surveillance program.

(7) New technology and spill containment programs. Where hazardous substances may be released by spilling from a container that will expose employees to the hazards of the materials, the employer will need to implement a program to contain and control the spilled material. Diking and ditching, as well as use of absorbents like diatomaceous earth, are traditional techniques which have proven to be effective over the years. However, in recent years new products have come into the marketplace, the use of which complement and increase the effectiveness of these traditional methods. These new products also provide emergency responders and others with additional tools or agents to use to reduce the hazards of spilled materials.

These agents can be rapidly applied over a large area and can be uniformly applied or otherwise can be used to build a small dam, thus improving the workers' ability to control spilled material. These application techniques enhance the intimate contact between the agent and the spilled material allowing for the quickest effect by the agent or quickest control of the spilled material. Agents are available to solidify liquid spilled materials, to suppress vapor generation from spilled materials, and to do both. Some special agents, which when applied as recommended by the manufacturer, will react in a controlled manner with the spilled material to neutralize acids or caustics, or greatly reduce the level of hazard of the spilled material.

There are several modern methods and devices for use by emergency response personnel or others involved with spill control efforts to safely apply spill control agents to control spilled material hazards. These include portable pressurized applicators similar to hand-held portable fire extinguishing devices, and nozzle and hose systems similar to portable fire fighting foam systems which allow the operator to apply the agent without having to come into contact with the spilled material. The operator is able to apply the agent to the spilled material from a remote position.

The solidification of liquids provides for rapid containment and isolation of hazardous substance spills. By directing the agent at run-off points or at the edges of the spill, the reactant solid will automatically create a barrier to slow or stop the spread of the material. Clean-up of hazardous substances as greatly improved when solidifying agents, acid or caustic neutralizers, or activated carbon absorbents are used. Properly applied, these agents can totally solidify liquid hazardous substances or neutralize or absorb them, which results in materials which are less hazardous and easier to handle, transport, and dispose of. The concept of spill treatment, to create less hazardous substances, will improve the safety and level of protection of employees working at spill clean-up operations or emergency response operations to spills of hazardous substances.

The use of vapor suppression agents for volatile hazardous substances, such as flammable liquids and those substances which present an inhalation hazard, is important for protecting workers. The rapid and uniform distribution of the agent over the surface of the spilled material can provide quick vapor knockdown. There are temporary and long-term foam-type agents which are effective on vapors and dusts, and activated carbon adsorption agents which are effective for vapor control and soaking-up of the liquid. The proper use

of hose lines or hand-held portable pressurized applicators provides good mobility and permits the worker to deliver the agent from a safe distance without having to step into the untreated spilled material. Some of these systems can be recharged in the field to provide coverage of larger spill areas than the design limits of a single charged applicator unit. Some of the more effective agents can solidify the liquid flammable hazardous substances and at the same time elevate the flashpoint above 140 deg. F so the resulting substance may be handled as a nonhazardous waste material if it meets the United States Environmental Protection Agency's 40 CFR part 261 requirements (see particularly Sec. 261.21).

All workers performing hazardous substance spill control work are expected to wear the proper protective clothing and equipment for the materials present and to follow the employer's established standard operating procedures for spill control. All involved workers need to be trained in the established operating procedures; in the use and care of spill control equipment; and in the associated hazards and control of such hazards of spill containment work.

These new tools and agents are the things that employers will want to evaluate as part of their new technology program. The treatment of spills of hazardous substances or wastes at an emergency incident as part of the immediate spill containment and control efforts is sometimes acceptable to EPA and a permit exception is described in 40 CFR 264.1 (g)(8) and 265.1 (c)(11).

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-3180, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW, 90-20-091 (Order 90-14), § 296-62-3180, filed 10/1/90, effective 11/15/90; 89-21-018 (Order 89-10), § 296-62-3180, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3180, filed 10/6/88, effective 11/7/88.]

WAC 296-62-3190 Appendix D—References. The following references may be consulted for further information on the subject of this notice:

- (1) *OSHA Instruction DFO CPL 2.70 - January 29, 1986, Special Emphasis Program: Hazardous Waste Sites.*
- (2) *OSHA Instruction DFO CPL 2-2.37A - January 29, 1986, Technical Assistance and Guidelines for Superfund and Other Hazardous Waste Site Activities.*
- (3) *OSHA Instruction DTS CPL 2.74 - January 29, 1986, Hazardous Waste Activity Form, OSHA 175.*
- (4) *Hazardous Waste Inspections Reference Manual, U.S. Department of Labor, Occupational Safety and Health Administration, 1986.*
- (5) *Memorandum of Understanding Among the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the United States Coast Guard, and the United States Environmental Protection Agency; Guidance for Worker Protection During Hazardous Waste Site Investigations and Clean-up and Hazardous Substance Emergencies; December 18, 1980.*
- (6) *National Priorities List, 1st Edition, October 1984; U.S. Environmental Protection Agency, Revised periodically.*
- (7) *Preparation of a Site Safety Plan, Field Standard Operating Procedures (F.S.O.P.) 9; U.S. Environmental Protection Agency, Office of Emergency and Remedial*

Response, Hazardous Response Support Division, April 1985.

(8) *Standard Operating Safety Guidelines; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, Environmental Response Team; November 1984.*

(9) *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), and Environmental Protection Agency (EPA); October 1985.*

(10) *Protecting Health and Safety at Hazardous Waste Sites: An Overview, U.S. Environmental Protection Agency, EPA/625/9-85/006; September 1985.*

(11) *Hazardous Waste Sites and Hazardous Substance Emergencies, NIOSH Worker Bulletin, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; December 1982.*

(12) *Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; October 1984.*

(13) *Report to the Congress on Hazardous Materials Training, Planning and Preparedness, Federal Emergency Management Agency, Washington, D.C., July 1986.*

(14) *Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety. U.S. Department of Transportation, Washington, D.C., May 1983.*

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-3190, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW, 90-20-091 (Order 90-14), § 296-62-3190, filed 10/1/90, effective 11/15/90; 89-21-018 (Order 89-10), § 296-62-3190, filed 10/10/89, effective 11/24/89; 88-21-002 (Order 88-23), § 296-62-3190, filed 10/6/88, effective 11/7/88.]

WAC 296-62-3195 Appendix E—Training curriculum guidelines. The following nonmandatory general criteria may be used for assistance in developing site-specific training curriculum used to meet the training requirements of WAC 296-62-3040 through 296-62-30465, 296-62-31435 through 296-62-31445, 296-62-31465, 296-62-4102 through 296-62-41021, and 296-62-41023.

These are generic guidelines and they are not presented as a complete training curriculum for any specific employer. Site-specific training programs must be developed on the basis of a needs assessment of the hazardous waste site, RCRA/TSD, or emergency response operation in accordance with this chapter (chapter 296-62 WAC, Part P and Part R).

The guidance set forth here presents a highly effective program that in the areas covered would meet or exceed the regulatory requirements. In addition, other approaches could meet the regulatory requirements.

Suggested general criteria:

Definitions:

"Competent" means possessing the skills, knowledge, experience, and judgment to perform assigned tasks or activities satisfactorily as determined by the employer.

"Demonstration" means the showing by actual use of equipment or procedures.

"Hands-on training" means training in a simulated work environment that permits each student to have experience performing tasks, making decisions, or using equipment appropriate to the job assignment for which the training is being conducted.

"Initial training" means training required prior to beginning work.

"Lecture" means an interactive discourse with a class led by an instructor.

"Proficient" means meeting a stated level of achievement.

"Site-specific" means individual training directed to the operations of a specific job site.

"Training hours" means the number of hours devoted to lecture, learning activities, small group work sessions, demonstration, evaluations, or hands-on experience.

Suggested core criteria:

(1) Training facility. The training facility should have available sufficient resources, equipment, and site locations to perform concise and hands-on training when appropriate. Training facilities should have sufficient organization, support staff, and services to conduct training in each of the courses offered.

(2) Training director. Each training program should be under the direction of a training director who is responsible for the program. The training director should have a minimum of two years of employee education experience.

(3) Instructors. Instructors should be deemed competent on the basis of previous documented experience in their area of instruction, successful completion of a "train-the-trainer" program specific to the topics they will teach, and an evaluation of instructional competence by the training director.

(a) Instructors should be required to maintain professional competency by participating in continuing education or professional development programs or by successfully completing an annual refresher course and having an annual review by the training director.

(b) The annual review by the training director should include observation of an instructor's delivery, a review of those observations with the trainer, and an analysis of any instructor or class evaluations completed by the students during the previous year.

(4) Course materials. The training director should approve all course materials to be used by the training provider. Course materials should be reviewed and updated at least annually. Materials and equipment should be in good working order and maintained properly.

(a) All written and audio-visual materials in training curricula should be peer reviewed by technically competent outside reviewers or by a standing advisory committee.

(b) Reviewers should possess expertise in the following disciplines were applicable: Occupational health, industrial hygiene and safety, chemical/environmental engineering, employee education, or emergency response. One or more of

the peer reviewers should be an employee experienced in the work activities to which the training is directed.

(5) Students. The program for accepting students should include:

(a) Assurance that the student is or will be involved in work where chemical exposures are likely and that the student possesses the skills necessary to perform the work.

(b) A policy on the necessary medical clearance.

(6) Ratios. Student-instructor ratios should not exceed thirty students per instructor. Hands-on activity requiring the use of personal protective equipment should have the following student-instructor ratios: For Level C or Level D personal protective equipment the ratio should be ten students per instructor. For Level A or Level B personal protective equipment the ratio should be five students per instructor.

(7) Proficiency assessment. Proficiency should be evaluated and documented by the use of a written assessment and a skill demonstration selected and developed by the training director and training staff. The assessment and demonstration should evaluate the knowledge and individual skills developed in the course of training. The level of minimum achievement necessary for proficiency must be specified in writing by the training director.

(a) If a written test is used, there should be a minimum of fifty questions. If a written test is used in combination with a skills demonstration, a minimum of twenty-five questions should be used. If a skills demonstration is used, the tasks chosen and the means to rate successful completion should be fully documented by the training director.

(b) The content of the written test or of the skill demonstration must be relevant to the objectives of the course.

The written test and skill demonstration should be updated as necessary to reflect changes in the curriculum and any update should be approved by the training director.

(c) The proficiency assessment methods, regardless of the approach or combination of approaches used, should be justified, documented and approved by the training director.

(d) The proficiency of those taking the additional courses for supervisors should be evaluated and documented by using proficiency assessment methods acceptable to the training director. These proficiency assessment methods must reflect the additional responsibilities borne by supervisory personnel in hazardous waste operations or emergency response.

(8) Course certificate. Written documentation should be provided to each student who satisfactorily completes the training course. The documentation should include:

(a) Student's name.

(b) Course title.

(c) Course date.

(d) Statement that the student has successfully completed the course.

(e) Name and address of the training provider.

(f) An individual identification number for the certificate.

(g) List of the levels of personal protective equipment used by the student to complete the course.

(i) This documentation may include a certificate and an appropriate wallet-sized laminated card with a photograph of the student and the above information.

(ii) When such course certificate cards are used, the individual identification number for the training certificate should be shown on the card.

(9) Recordkeeping. Training providers should maintain records listing the dates courses were presented, the names of the individual course attendees, the names of those students successfully completing each course, and the number of training certificates issued to each successful student. These records should be maintained for a minimum of five years after the date an individual participated in a training program offered by the training provider. These records should be available and provided upon the student's request or as mandated by law.

(10) Program quality control. The training director should conduct or direct an annual written audit of the training program. Program modifications to address deficiencies, if any, should be documented, approved, and implemented by the training provider. The audit and the program modification documents should be maintained at the training facility.

Suggested Program Quality Control Criteria:

Factors listed here are suggested criteria for determining the quality and appropriateness of employee health and safety training for hazardous waste operations and emergency response.

(1) Training plan. Adequacy and appropriateness of the training program's curriculum development, instructor training, distribution of course materials, and direct student training should be considered, including:

(a) The duration of training, course content, and course schedules/agendas;

(b) The different training requirements of the various target populations, as specified in the appropriate generic training curriculum;

(c) The process for the development of curriculum, which includes appropriate technical input, outside review, evaluation, program pretesting.

(d) The adequate and appropriate inclusion of hands-on, demonstration, and instruction methods;

(e) Adequate monitoring of student safety, progress, and performance during the training.

(2) Program management, training director, staff, and consultants. Adequacy and appropriateness of staff performance and delivering an effective training program should be considered, including:

(a) Demonstration of the training director's leadership in assuring quality of health and safety training;

(b) Demonstration of the competency of the staff to meet the demands of delivering high quality hazardous waste employee health and safety training;

(c) Organization charts establishing clear lines of authority;

(d) Clearly defined staff duties including the relationship of the training staff to the overall program;

(e) Evidence that the training organizational structure suits the needs of the training program;

(f) Appropriateness and adequacy of the training methods used by the instructors;

(g) Sufficiency of the time committed by the training director and staff to the training program;

(h) Adequacy of the ratio of training staff to students;

(i) Availability and commitment of the training program of adequate human and equipment resources in the areas of:

- (i) Health effects;
- (ii) Safety;
- (iii) Personal protective equipment (PPE);
- (iv) Operational procedures;
- (v) Employee protection practices/procedures;
- (j) Appropriateness of management controls;
- (k) Adequacy of the organization and appropriate resources assigned to assure appropriate training;

(l) In the case of multiple-site training programs, adequacy of management of the satellite centers.

(3) Training facilities and resources. Adequacy and appropriateness of the facilities and resources for supporting the training program should be considered, including:

- (a) Space and equipment to conduct the training;
- (b) Facilities for representative hands-on training;
- (c) In the case of multiple-site programs, equipment and facilities at the satellite centers;

(d) Adequacy and appropriateness of the quality control and evaluations program to account for instructor performance;

(e) Adequacy and appropriateness of the quality control and evaluation program to ensure appropriate course evaluation, feedback, updating, and corrective action;

(f) Adequacy and appropriateness of disciplines and expertise being used within the quality control and evaluation program;

(g) Adequacy and appropriateness of the role of student evaluations to provide feedback for training program improvement.

(4) Quality control and evaluation. Adequacy and appropriateness of quality control and evaluation plans for training programs should be considered, including:

(a) A balanced advisory committee and/or competent outside reviewers to give overall policy guidance;

(b) Clear and adequate definition of the composition and active programmatic role of the advisory committee or outside reviewers;

(c) Adequacy of the minutes or reports of the advisory committee or outside reviewers' meetings or written communication;

(d) Adequacy and appropriateness of the quality control and evaluations program to account for instructor performance;

(e) Adequacy and appropriateness of the quality control and evaluation program to ensure appropriate course evaluation, feedback, updating, and corrective action;

(f) Adequacy and appropriateness of disciplines and expertise being used within the quality control and evaluation program;

(g) Adequacy and appropriateness of the role of student evaluations to provide feedback for training program improvement.

(5) Students. Adequacy and appropriateness of the program for accepting students should be considered, including:

(a) Assurance that the student already possess the necessary skills for their job, including necessary documentation;

(b) Appropriateness of methods the program uses to ensure that recruits are capable of satisfactorily completing training;

(c) Review and compliance with any medical clearance policy.

(6) Institutional environment and administrative support. The adequacy and appropriateness of the institutional environment and administrative support system for the training program should be considered, including:

(a) Adequacy of the institutional commitment to the employee training program;

(b) Adequacy and appropriateness of the administrative structure and administrative support.

(7) Summary of evaluation questions. Key questions for evaluating the quality and appropriateness of an overall training program should include the following:

(a) Are the program objectives clearly stated?

(b) Is the program accomplishing its objectives?

(c) Are appropriate facilities and staff available?

(d) Is there an appropriate mix of classroom, demonstration, and hands-on training?

(e) Is the program providing quality employee health and safety training that fully meets the intent of regulatory requirements?

(f) What are the program's main strengths?

(g) What are the program's main weaknesses?

(h) What is recommended to improve the program?

(i) Are instructors instructing according to their training outlines?

(j) Is the evaluation tool current and appropriate for the program content?

(k) Is the course material current and relevant to the target group?

Suggested Training Curriculum Guidelines:

The following training curriculum guidelines are for those operations specifically identified in this Part P, as requiring training. Issues such as qualifications of instructors, training certification, and similar criteria appropriate to all categories of operations addressed in this Part P, have been covered in the preceding section and are not readdressed in each of the generic guidelines. Basic core requirements for training programs that are addressed include: (1) *General hazardous waste operations*; (2) *RCRA operations—Treatment, storage, and disposal facilities*.

(1) General hazardous waste operations and site-specific training.

(a) Off-site training. Training course content for hazardous waste operations, required by WAC 296-62-3040 through 296-62-30465, should include the following topics or procedures:

(i) Regulatory knowledge.

(A) A review of this Part P and the core elements of an occupational safety and health program.

(B) The content of a medical surveillance program as outlined in WAC 296-62-3050 through 296-62-30535.

(C) The content of an effective site safety and health plan consistent with the requirements of WAC 296-62-30135(2).

(D) Emergency response plan and procedures as outlined in WAC 296-24-567 and 296-62-3110 through 296-62-31110.

(E) Adequate illumination.

(F) Sanitation recommendation and equipment.

(G) Review and explanation of WISHA's hazard-communication standard chapter 296-62 WAC, Part C, and chapter 296-24 WAC, Part A-4, safety procedures for the control of hazardous energy (lockout/tagout).

(H) Review of other applicable standards including but not limited to those in the construction standards, chapter 296-155 WAC.

(I) Rights and responsibilities of employers and employees under applicable WISHA/OSHA and department of ecology (DOE)/Environmental Protection Association (EPA) regulations and laws.

(ii) Technical knowledge.

(A) Type of potential exposures to chemical, biological, and radiological hazards; types of human responses to these hazards and recognition of those responses; principles of toxicology and information about acute and chronic hazards; health and safety considerations of new technology.

(B) Fundamentals of chemical hazards including but not limited to vapor pressure, boiling points, flash points, pH, other physical and chemical properties.

(C) Fire and explosion hazards of chemicals.

(D) General safety hazards such as but not limited to electrical hazards, powered equipment hazards, motor vehicle hazards, walking-working surface hazards, excavation hazards, and hazards associated with working in hot and cold temperature extremes.

(E) Review and knowledge of confined space entry procedures in chapter 296-62 WAC, Part M.

(F) Work practices to minimize employee risk from site hazards.

(G) Safe use of engineering controls, equipment, and any new relevant safety technology or safety procedures.

(H) Review and demonstration of competency with air sampling and monitoring equipment that may be used in a site monitoring program.

(I) Container sampling procedures and safeguarding; general drum and container handling procedures including special requirement for laboratory waste packs, shock-sensitive wastes, and radioactive wastes.

(J) The elements of a spill control program.

(K) Proper use and limitations of material handling equipment.

(L) Procedures for safe and healthful preparation of containers for shipping and transport.

(M) Methods of communication including those used while wearing respiratory protection.

(iii) Technical skills.

(A) Selection, use maintenance, and limitations of personal protective equipment including the components and procedures for carrying out a respirator program to comply with chapter 296-62 WAC Part E, Respiratory Protection.

(B) Instruction in decontamination programs including personnel, equipment, and hardware; hands-on training including Levels A, B, and C ensembles and appropriate decontamination lines; field activities including the donning and doffing of protective equipment to a level commensurate with the employee's anticipated job function and responsibility and to the degree required by potential hazards.

(C) Sources for additional hazard information; exercises using relevant manuals and hazard coding systems.

(iv) Additional suggested items.

(A) A laminated, dated card or certificate with photo, denoting limitations and level of protection for which the employee is trained should be issued to those students successfully completing a course.

(B) Attendance should be required at all training modules, with successful completion of exercises and a final written or oral examination with at least fifty questions.

(C) A minimum of one-third of the program should be devoted to hands-on exercises.

(D) A curriculum should be established for the eight-hour refresher training required by WAC 296-62-30460, with delivery of such courses directed toward those areas of previous training that need improvement or reemphasis.

(E) A curriculum should be established for the required eight-hour training for supervisors. Demonstrated competency in the skills and knowledge provided in forty-hour and eighty-hour courses should be prerequisites for supervisor training.

(b) Refresher training. The eight-hour annual refresher training required in WAC 296-62-30460 should be conducted by qualified training providers. Refresher training should include at a minimum the following topics and procedures:

(i) Review of and retraining on relevant topics covered in the forty-hour and eighty-hour programs, as appropriate, using reports by the students on their work experiences.

(ii) Update on developments with respect to material covered in the forty-hour and eighty-hour courses.

(iii) Review of changes to pertinent provisions of DOE/EPA or WISHA/OSHA standards or laws.

(iv) Introduction of additional subject areas as appropriate.

(v) Hands-on review of new or altered PPE or decontamination equipment or procedures. Review of new developments in personal protective equipment.

(vi) Review of newly developed air and contaminant monitoring equipment.

(c) On-site training. The employer should provide employees engaged in hazardous waste site activities with information and training prior to initial assignment into their work area, as follows:

(i) The requirements of the hazard communication program including the location and availability of the written program, required lists of hazardous chemicals, and material safety data sheets.

(ii) Activities and locations in their work area where hazardous substance may be present.

(iii) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearances, or other evidence (sight, sound or smell)) of hazardous chemicals being released, and applicable alarms from monitoring devices that record chemical releases.

(iv) The physical and health hazards of substances known or potentially present in the work area.

(v) The measures employees can take to help protect themselves from worksite hazards, including specific procedures the employer has implemented.

(vi) An explanation of the labeling system and material safety data sheets and how employees can obtain and use appropriate hazard information.

(vii) The elements of the confined space program including special PPE, permits, monitoring requirements, communication procedures, emergency response, and applicable lockout procedures.

(d) The employer should provide hazardous waste employees with information and training and should provide a review and access to the site safety and health plan as follows:

(i) Names of personnel and alternate responsible for site safety and health.

(ii) Safety and health hazards present on the site.

(iii) Selection, use, maintenance, and limitations of personal protective equipment specific to the site.

(iv) Work practices by which the employee can minimize risks from hazards.

(v) Safe use of engineering controls and equipment available on site.

(vi) Safe decontamination procedures established to minimize employee contact with hazardous substances, including:

(A) Employee decontamination;

(B) Clothing decontamination; and

(C) Equipment decontamination.

(vii) Elements of the site emergency response plan, including:

(A) Preemergency planning.

(B) Personnel roles and lines of authority and communication.

(C) Emergency recognition and prevention.

(D) Safe distances and places of refuge.

(E) Site security and control.

(F) Evacuation routes and procedures.

(G) Decontamination procedures not covered by the site safety and health plan.

(H) Emergency medical treatment and first aid.

(I) Emergency equipment and procedures for handling emergency incidents.

(e) The employer should provide hazardous waste employees with information and training on personal protective equipment used at the site, such as the following:

(i) PPE to be used based upon known or anticipated site hazards.

(ii) PPE limitations of materials and construction; limitations during temperature extremes, heat stress, and other appropriate medical considerations; use and limitations of respirator equipment as well as documentation procedures as outlined in chapter 296-62 WAC, Part E, Respiratory Protection.

(iii) PPE inspection procedures prior to, during, and after use.

(iv) PPE donning and doffing procedures.

(v) PPE decontamination and disposal procedures.

(vi) PPE maintenance and storage.

(vii) Task duration as related to PPE limitations.

(f) The employer should instruct the employee about the site medical surveillance program relative to the particular site, including:

(i) Specific medical surveillance programs that have been adapted for the site.

(ii) Specific signs and symptoms related to exposure to hazardous materials on the site.

(iii) The frequency and extent of periodic medical examinations that will be used on the site.

(iv) Maintenance and availability of records.

(v) Personnel to be contacted and procedures to be followed when signs and symptoms of exposures are recognized.

(g) The employees will review and discuss the site safety and health plan as part of the training program. The location of the site safety and health plan and all written programs should be discussed with employees including a discussion of the mechanisms for access, review, and references described.

(2) RCRA operations training for treatment, storage and disposal facilities.

(a) As a minimum, the training course required in WAC 296-62-31435 through 296-62-31440 and 296-62-31465 should include the following topics:

(i) Review of the applicable parts of this Part P and the elements of the employer's occupational safety and health plan.

(ii) Review of relevant hazards such as, but not limited to, chemical, biological, and radiological exposures; fire and explosion hazards; thermal extremes; and physical hazards.

(iii) General safety hazards including those associated with electrical hazards, powered equipment hazards, lockout/tagout procedures, motor vehicle hazards and walking-working surface hazards.

(iv) Confined space hazards and procedures.

(v) Work practices to minimize employee risk from workplace hazards.

(vi) Emergency response plan and procedures including first aid meeting the requirements of WAC 296-62-31450.

(vii) A review of procedures to minimize exposure to hazardous waste and various type of waste streams, including the materials handling program and spill containment program.

(viii) A review of hazard communication programs meeting the requirements of chapter 296-62 WAC, Part C.

(ix) A review of medical surveillance programs meeting the requirements of WAC 296-62-3050 and 296-62-31415 including the recognition of signs and symptoms of overexposure to hazardous substance including known synergistic interactions.

(x) A review of decontamination programs and procedures meeting the requirements of WAC 296-62-3100 and 296-62-31420.

(xi) A review of an employer's requirements to implement a training program and its elements.

(xii) A review of the criteria and programs for proper selection and use of personal protective equipment, including respirators.

(xiii) A review of the applicable appendices to this Part P (Appendices A through E).

(xiv) Principles of toxicology and biological monitoring as they pertain to occupational health.

(xv) Rights and responsibilities of employees and employers under applicable WISHA/OSHA and DOE/EPA regulations and laws.

(xvi) Hands-on exercises and demonstrations of competency with equipment to illustrate the basic equipment principles that may be used during the performance of work duties, including the donning and doffing of PPE.

(xvii) Sources of reference, efficient use of relevant manuals, and knowledge of hazard coding systems to include information contained in hazardous waste manifests.

(xviii) At least eight hours of hands-on training.

(xix) Training in the job skills required for an employee's job function and responsibility before they are permitted to participate in or supervise field activities.

(b) The individual employer should provide hazardous waste employees with information and training prior to an employee's initial assignment into a work area. The training and information should cover the following topics:

(i) The emergency response plan and procedures including first aid.

(ii) A review of the employer's hazardous waste handling procedures including the materials handling program and elements of the spill containment program, location of spill response kits or equipment, and the names of those trained to respond to releases.

(iii) The hazardous communication program meeting the requirements of chapter 296-62 WAC, Part C.

(iv) A review of the employer's medical surveillance program including the recognition of signs and symptoms of exposure to relevant hazardous substance including known synergistic interactions.

(v) A review of the employer's decontamination program and procedures.

(vi) A review of the employer's training program and the parties responsible for that program.

(vii) A review of the employer's personal protective equipment program including the proper selection and use of PPE based upon specific site hazards.

(viii) All relevant site-specific procedures addressing potential safety and health hazards. This may include, as appropriate, biological and radiological exposures, fire and explosion hazards, thermal hazards, and physical hazards such as electrical hazards, powered equipment hazards, lockout/tagout hazards, motor vehicle hazards, and walking-working surface hazards.

(ix) Safe use of engineering controls and equipment on-site.

(x) Names of personnel and alternates responsible for safety and health.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-3195, filed 3/23/99, effective 6/23/99. Statutory Authority: Chapter 49.17 RCW. 95-04-006, § 296-62-3195, filed 1/18/95, effective 3/10/95.]

PART Q—HAZARDOUS CHEMICALS IN LABORATORIES

WAC 296-62-400 Occupational exposure to hazardous chemicals in laboratories. Reserved.

[Title 296 WAC—p. 1850]

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-400, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40001 Scope and application. (1) This section shall apply to all employers and employees engaged in the laboratory use of hazardous chemicals as follows:

(a) Where this section applies, it shall supersede, for laboratories, the requirements of all other WISHA health standards in chapter 296-62 WAC, except for any WISHA health standard, only the requirement to limit employee exposure to the specific permissible exposure limit shall apply for laboratories, unless that particular standard states otherwise or unless the conditions of subdivision (c) of this section apply.

(b) Prohibition of eye and skin contact where specified by any WISHA health standard shall be observed.

(c) Where the action level (or in the absence of an action level, the permissible exposure limit) is routinely exceeded for a WISHA regulated substance with exposure monitoring and medical surveillance requirements, of WAC 296-62-40007.

(2) This section shall not apply to:

(a) Uses of hazardous chemicals which do not meet the definition of laboratory use, and in such cases, the employer shall comply with the relevant standard in WAC 296-62-075, even if such use occurs in a laboratory.

(b) Laboratory uses of hazardous chemicals which provide no potential for employee exposure. Examples of such conditions might include:

(i) Procedures using chemically-impregnated test media such as Dip-and-Read tests where a reagent strip is dipped into the specimen to be tested and the results are interpreted by comparing the color reaction to a color chart supplied by the manufacturer of the test strip; and

(ii) Commercially prepared kits such as those used in performing pregnancy tests in which all of the reagents needed to conduct the test are contained in the kit.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40001, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40003 Definitions applicable to all sections of this chapter. Unless the context indicates otherwise, words used in this chapter shall have the meaning given in this section.

(1) "Action level" means a concentration designated in WAC 296-62-075 for a specific substance, calculated as an 8-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

(2) "Carcinogen" (see "select carcinogen").

(3) "Chemical hygiene officer" means an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the chemical hygiene plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

(4) "Chemical hygiene plan" means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment, and

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work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and meets the requirements of WAC 296-62-40009.

(5) "Combustible liquid" means any liquid having a flashpoint at or above 100°F (37.8°C), but below 200°F (93.3°C), except any mixture having components with flashpoints of 200°F (93.3°C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

(6) "Compressed gas" means:

(a) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or

(b) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C); or

(c) A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

(7) "Designated area" means an area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

(8) "Director" means the director of the department of labor and industries or his/her designee.

(9) "Emergency" means any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

(10) "Employee" means an individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

(11) "Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

(12) "Flammable" means a chemical that falls into one of the following categories:

(a) "Aerosol, flammable" means an aerosol that, when tested by the method described in 16 C.F.R. 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(b) "Gas, flammable" means:

(i) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or

(ii) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.

(c) "Liquid, flammable" means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F (37.8°C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.

(d) "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in WAC 296-52-417, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create

a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 C.F.R. 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

(13) "Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(a) Tagliabue Closed Tester (see American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79))-for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg.F (37.8°C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(b) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79))-for liquids with a viscosity equal to or greater than 45 SUS at 100 deg.F (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(c) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).

Note: Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

(14) "Hazardous chemical" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Note: Appendices A and B of the Hazard Communication Standard (WAC 296-62-054) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

(15) "Laboratory" means a facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a nonproduction basis.

(16) "Laboratory scale" means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

(17) "Laboratory-type hood" means a device located in a laboratory, enclosure on five sides with a moveable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Note: Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

(18) "Laboratory use of hazardous chemicals" means handling or use of such chemicals in which all of the following conditions are met:

(a) Chemical manipulations are carried out on a "laboratory scale";

(b) Multiple chemical procedures or chemicals are used;

(c) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(d) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

(19) "Medical consultation" means a consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

(20) "Organic peroxide" means an organic compound that contains the bivalent -O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

(21) "Oxidizer" means a chemical other than a blasting agent or explosive as defined in WAC 296-52-417, that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

(22) "Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

(23) "Protective laboratory practices and equipment" means those laboratory procedures, practices, and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

(24) "Reproductive toxins" means chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

(25) "Select carcinogen" means any substance which meets one of the following criteria:

(a) It is regulated by WISHA as a carcinogen; or

(b) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or

(c) It is listed under Group I ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

(d) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(i) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m³; or

(ii) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(iii) After oral dosages of less than 50 mg/kg of body weight per day.

(26) "Unstable (reactive)" means a chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shock, pressure, or temperature.

(27) "Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40003, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40005 Permissible exposure limits. For laboratory uses of WISHA regulated substances, the employer shall assure that laboratory employees' exposures to such substances do not exceed the permissible exposure limits specified in WAC 296-62-075.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40005, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40007 Employee exposure determination. (1) Initial monitoring. The employer shall measure the employee's exposure to any substance regulated by a standard which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the action level (or in the absence of an action level, the PEL).

(2) Periodic monitoring. If the initial monitoring prescribed by subsection (1) of this section discloses employee exposure over the action level (or in the absence of an action level, the PEL), the employer shall immediately comply with the exposure monitoring provisions of chapter 296-62 WAC.

(3) Termination of monitoring. Monitoring may be terminated in accordance with chapter 296-62 WAC.

(4) Employee notification of monitoring results. The employer shall, within 15 working days after the receipt of any monitoring results, notify the employee of these results in writing either individually or by posting results in an appropriate location that is accessible to employees.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40007, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40009 Chemical hygiene plan—General. (1) Where hazardous chemicals as defined by this standard are used in the workplace, the employer shall develop and carry out the provisions of a written chemical hygiene plan which is:

(a) Capable of protecting employees from health hazards associated with hazardous chemicals in that laboratory; and

(b) Capable of keeping exposures below the limits specified in WAC 296-62-40005.

(2) The chemical hygiene plan shall be readily available to employees, employee representatives and, upon request, to the director of the department of labor and industries.

(3) The chemical hygiene plan shall include each of the following elements and shall indicate specific measures that the employer will take to ensure laboratory employee protection:

(a) Standard operating procedures for safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals;

(b) Criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment, and hygiene practices. Particular attention shall be given to the selection of control measures for chemicals that are known to be extremely hazardous;

(c) A requirement that fume hoods and other protective equipment are functioning properly and specific measures that shall be taken to ensure proper and adequate performance of such equipment;

(d) Provisions for employee information and training as prescribed in WAC 296-62-40011;

(e) The circumstances under which a particular laboratory operation, procedure, or activity shall require prior approval from the employer or the employer's designee before implementation;

(f) Provisions for medical consultation and medical examinations in accordance with WAC 296-62-40013;

(g) Designation of personnel responsible for implementation of the chemical hygiene plan including the assignment of a chemical hygiene officer and, if appropriate, establishment of a chemical hygiene committee; and

(h) Provisions for additional employee protection for work with particularly hazardous substances. These include "select carcinogens," reproductive toxins and substances which have a high degree of acute toxicity. Specific consideration shall be given to the following provisions which shall be included where appropriate:

(i) Establishment of a designated area;

(ii) Use of containment devices such as fume hoods or glove boxes;

(iii) Procedures for safe removal of contaminated waste; and

(iv) Decontamination procedures.

(4) The employer shall review and evaluate the effectiveness of the chemical hygiene plan at least annually and update it as necessary.

(5) Appendix A of this section is nonmandatory but provides guidance to assist employers in the development of the chemical hygiene plan.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40009, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40011 Employee information and training. (1) The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.

(2) Such information shall be provided at the time of an employee's initial assignment to a work area where hazardous chemicals are present and prior to assignments involving new exposure situations. The frequency of refresher information and training shall be determined by the employer.

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(3) Information. Employees shall be informed of:

(a) The contents of this standard and its appendices which shall be made available to employees;

(b) The location and availability of the employer's chemical hygiene plan;

(c) The permissible exposure limits for WISHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable WISHA standard;

(d) Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and

(e) The location and availability of known reference material on the hazards, safe handling, storage, and disposal of hazardous chemicals found in the laboratory including, but not limited to, material safety data sheets received from the chemical supplier.

(4) Training. Employee training shall include:

(a) Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

(b) The physical and health hazards of chemicals in the work area; and

(c) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used.

(5) The employee shall be trained on the applicable details of the employer's written chemical hygiene plan.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40011, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40013 Medical consultation and medical examinations. (1) The employer shall provide all employees who work with hazardous chemicals an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

(a) Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory, the employee shall be provided an opportunity to receive an appropriate medical examination.

(b) Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for a WISHA regulated substance for which there are exposure monitoring and medical surveillance requirements, medical surveillance shall be established for the affected employee as prescribed by the particular standard.

(c) Whenever an event takes place in the work area such as a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee shall be provided an opportunity for a medical consultation. Such consultation shall be for the purpose of determining the need for a medical examination.

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(2) All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

(3) Information provided to the physician. The employer shall provide the following information to the physician:

(a) The identity of the hazardous chemical(s) to which the employee may have been exposed;

(b) A description of the conditions under which the exposure occurred including quantitative exposure data, if available; and

(c) A description of the signs and symptoms of exposure that the employee is experiencing, if any.

(4) Physician's written opinion.

(a) For examination or consultation required under this standard, the employer shall obtain a written opinion from the examining physician which shall include the following:

(i) Any recommendation for further medical follow-up;

(ii) The results of the medical examination and any associated tests;

(iii) Any medical condition which may be revealed in the course of the examination which may place the employee at increased risk as a result of exposure to a hazardous chemical found in the workplace; and

(iv) A statement that the employee has been informed by the physician of the results of the consultation or medical examination and any medical condition that may require further examination or treatment.

(b) The written opinion shall not reveal specific findings of diagnoses unrelated to occupational exposure.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40013, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40015 Hazard identification. (1) With respect to labels and material safety data sheets:

(a) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced.

(b) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

(2) The following provisions shall apply to chemical substances developed in the laboratory:

(a) If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in the definition section, Part Q of this standard. If the chemical is determined to be hazardous, the employer shall provide appropriate training as required under WAC 296-62-40011.

(b) If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and shall implement WAC 296-62-40009.

(c) If the chemical substance is produced for another user outside of the laboratory, the employer shall comply with the hazard communication standard (WAC 296-62-054) including the requirements for preparation of material safety data sheets and labeling.

[Title 296 WAC—p. 1854]

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-40015, filed 7/20/94, effective 9/20/94; 90-17-051 (Order 90-10), § 296-62-40015, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40017 Use of respirators. Where the use of respirators is necessary to maintain exposure below permissible exposure limits, the employer shall provide, at no cost to the employee, the proper respiratory equipment. Respirators shall be selected and used in accordance with the requirements of WAC 296-62-071.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40017, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40019 Recordkeeping. (1) The employer shall establish and maintain for each employee an accurate record of any measurements taken to monitor employee exposures and any medical consultation and examinations including tests or written opinions required by this standard.

(2) The employer shall assure that such records are kept, transferred, and made available in accordance with WAC 296-62-052.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40019, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40021 Start-up date. Employers shall have developed and implemented a written chemical hygiene plan no later than January 31, 1991.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40021, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40023 Appendices. The information contained in the appendices is not intended by itself to create any additional obligations not otherwise imposed or to detract from any existing obligation.

[Statutory Authority: Chapter 49.17 RCW. 90-17-051 (Order 90-10), § 296-62-40023, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40025 Appendix A—National Research Council recommendations concerning chemical hygiene in laboratories (nonmandatory). (1) Table of contents.

- (a) General principles.
 - (i) Minimize all chemical exposures.
 - (ii) Avoid underestimation of risk.
 - (iii) Provide adequate ventilation.
 - (iv) Institute a chemical hygiene program.
 - (v) Observe the PELs and TLVs.
- (b) Responsibilities.
 - (i) Chief executive officer.
 - (ii) Supervisor of administrative unit.
 - (iii) Chemical hygiene officer.
 - (iv) Laboratory supervisor.
 - (v) Project director.
 - (vi) Laboratory worker.
- (c) The laboratory facility.
 - (i) Design.
 - (ii) Maintenance.
 - (iii) Usage.
 - (iv) Ventilation.
- (d) Components of the chemical hygiene plan.

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- (i) Basic rules and procedures.
- (ii) Chemical procurement, distribution, and storage.
- (iii) Environmental monitoring.
- (iv) Housekeeping, maintenance, and inspections.
- (v) Medical program.
- (vi) Personal protective apparel and equipment.
- (vii) Records.
- (viii) Signs and labels.
- (ix) Spills and accidents.
- (x) Training and information.
- (xi) Waste disposal.
- (e) General procedures for working with chemicals.
- (i) General rules for all laboratory work with chemicals.
- (ii) Allergens and embryotoxins.
- (iii) Chemicals of moderate chronic or high acute toxicity.
- (iv) Chemicals of high chronic toxicity.
- (v) Animal work with chemicals of high chronic toxicity.
- (f) Safety recommendations.
- (g) Material safety data sheets.
- (2) Foreword.

(a) As guidance for each employer's development of an appropriate laboratory chemical hygiene plan, the following nonmandatory recommendations are provided. They were extracted from "Prudent Practices for Handling Hazardous Chemicals in Laboratories" (referred to below as "Prudent Practices"), which was published in 1981 by the National Research Council and is available from the National Academy Press, 2101 Constitution Ave., N.W., Washington DC 20418.

(b) "Prudent practices" is cited because of its wide distribution and acceptance and because of its preparation by members of the laboratory community through the sponsorship of the National Research Council. However, none of the recommendations given here will modify any requirements of the laboratory standard. This appendix merely presents pertinent recommendations from "prudent practices," organized into a form convenient for quick reference during operation of a laboratory facility and during development and application of a chemical hygiene plan. Users of this appendix should consult "prudent practices" for a more extended presentation and justification for each recommendation.

(c) "Prudent practices" deals with both safety and chemical hazards while the laboratory standard is concerned primarily with chemical hazards. Therefore, only those recommendations directed primarily toward control of toxic exposures are cited in this appendix, with the term "chemical hygiene" being substituted for the word "safety." However, since conditions producing or threatening physical injury often pose toxic risks as well, page references concerning major categories of safety hazards in the laboratory are given in section F.

(d) The recommendations from "prudent practices" have been paraphrased, combined, or otherwise reorganized, and headings have been added. However, their sense has not been changed.

(e) Corresponding sections of the standard and this appendix.

(f) The following table is given for the convenience of those who are developing a chemical hygiene plan which will

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satisfy the requirements of WAC 296-62-40009. It indicates those sections of this appendix which are most pertinent to each of the sections of WAC 296-62-40009 and related sections.

Subsection and Topic in Laboratory Standard	Relevant Appendix Section
(3)(a) Standard operating procedures for handling toxic chemicals.	(c)(d)(e)
(3)(b) Criteria to be used for implementation of measures to reduce exposures.	(d)
(3)(c) Fume hood performance	(c)(iv)(B)
(3)(d) Employee information and training (including emergency procedures).	(d)(x), (d)(ix)
(3)(e) Requirements for prior approval of laboratory activities.	(e)(ii)(B), (e)(v)(B)
(3)(f) Medical consultation and medical examinations.	(d)(v), (e)(v)(G)
(3)(g) Chemical hygiene responsibilities.	(b)
(3)(h) Special precautions for work with particularly hazardous substances.	(e)(ii)(iii)(v)

(3) In this appendix, those recommendations directed primarily at administrators and supervisors are given in sections (a) through (d). Those recommendations of primary concern to employees who are actually handling laboratory chemicals are given in section E. (Reference to page numbers in "prudent practices" are given in parentheses.)

(a) General principles for work with laboratory chemicals in addition to the more detailed recommendations listed below in sections (b) through (e), "prudent practices" expresses certain general principles, including the following:

(i) It is prudent to minimize all chemical exposures. Because few laboratory chemicals are without hazards, general precautions for handling all laboratory chemicals should be adopted, rather than specific guidelines for particular chemicals (2, 10). Skin contact with chemicals should be avoided as a cardinal rule (198).

(ii) Avoid underestimation of risk. Even for substances of no known significant hazard, exposure should be minimized; for work with substances which present special hazards, special precautions should be taken (10, 37, 38). One should assume that any mixture will be more toxic than its most toxic component (30, 103) and that all substances of unknown toxicity are toxic (3, 34).

(iii) Provide adequate ventilation. The best way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by use of hoods and other ventilation devices (32, 198).

(iv) Institute a chemical hygiene program. A mandatory chemical hygiene program designed to minimize exposures is needed; it should be a regular, continuing effort, not merely a standby or short-term activity (6, 11). Its recommendations

should be followed in academic teaching laboratories as well as by full-time laboratory workers (13).

(v) Observe the PELs, TLVs. The permissible exposure limits of WISHA and the threshold limit values of the American Conference of Governmental Industrial Hygienists should not be exceeded (13).

(b) Chemical hygiene responsibilities. Responsibility for chemical hygiene rests at all levels (6, 11, 21) including the:

(i) Chief executive officer, who has ultimate responsibility for chemical hygiene within the institution and must, with other administrators, provide continuing support for institutional chemical hygiene (7, 11).

(ii) Supervisor of the department or other administrative unit, who is responsible for chemical hygiene in that unit (7).

(iii) Chemical hygiene officer(s), whose appointment is essential (7) and who must:

(A) Work with administrators and other employees to develop and implement appropriate chemical hygiene policies and practices (7);

(B) Monitor procurement, use, and disposal of chemicals used in the lab (8);

(C) See that appropriate audits are maintained (8);

(D) Help project directors develop precautions and adequate facilities (10);

(E) Know the current legal requirements concerning regulated substances (50); and

(F) Seek ways to improve the chemical hygiene program (8, 11).

(iv) Laboratory supervisor, who has overall responsibility for chemical hygiene in the laboratory (21) including responsibility to:

(A) Ensure that workers know and follow the chemical hygiene rules, that protective equipment is available and in working order, and that appropriate training has been provided (21, 22);

(B) Provide regular, formal chemical hygiene and house-keeping inspections including routine inspections of emergency equipment (21, 171);

(C) Know the current legal requirements concerning regulated substances (50, 231);

(D) Determine the required levels of protective apparel and equipment (156, 160, 162); and

(E) Ensure that facilities and training for use of any material being ordered are adequate (215).

(v) Project director or director of other specific operation, who has primary responsibility for chemical hygiene procedures for that operation (7).

(vi) Laboratory worker, who is responsible for:

(A) Planning and conducting each operation in accordance with the institutional chemical hygiene procedures (7, 21, 22, 230); and

(B) Developing good personal chemical hygiene habits (22).

(c) The laboratory facility:

(i) Design. The laboratory facility should have:

(A) An appropriate general ventilation system (see C4 below) with air intakes and exhausts located so as to avoid intake of contaminated air (194);

(B) Adequate, well-ventilated stockrooms/storerooms (218, 219);

(C) Laboratory hoods and sinks (12, 162);

(D) Other safety equipment including eyewash fountains and drench showers (162, 169); and

(E) Arrangements for waste disposal (12, 240).

(ii) Maintenance. Chemical-hygiene-related equipment (hoods, incinerator, etc.) should undergo continuing appraisal and be modified if inadequate (11, 12).

(iii) Usage. The work conducted (10) and its scale (12) must be appropriate to the physical facilities available and, especially, to the quality of ventilation (13).

(iv) Ventilation.

(A) General laboratory ventilation. This system should: Provide a source of air for breathing and for input to local ventilation devices (199); it should not be relied on for protection from toxic substances released into the laboratory (198); ensure that laboratory air is continually replaced, preventing increase of air concentrations of toxic substances during the working day (194); direct air flow into the laboratory from nonlaboratory areas and out to the exterior of the building (194).

(B) Hoods. A laboratory hood with 2.5 linear feet of hood space per person should be provided for every 2 workers if they spend most of their time working with chemicals (199); each hood should have a continuous monitoring device to allow convenient confirmation of adequate hood performance before use (200, 209). If this is not possible, work with substances of unknown toxicity should be avoided (13) or other types of local ventilation devices should be provided (199). (See pp. 201-206 for a discussion of hood design, construction, and evaluation.)

(C) Other local ventilation devices. Ventilated storage cabinets, canopy hoods, snorkels, etc., should be provided as needed (199). Each canopy hood and snorkel should have a separate exhaust duct (207).

(D) Special ventilation areas. Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or other treatment before release into the regular exhaust system (208). Cold rooms and warm rooms should have provisions for rapid escape and for escape in the event of electrical failure (209).

(E) Modifications. Any alteration of the ventilation system should be made only if thorough testing indicates that worker protection from airborne toxic substances will continue to be adequate (12, 193, 204).

(F) Performance. Rate: 4-12 room air changes/hour is normally adequate general ventilation if local exhaust systems such as hoods are used as the primary method of control (194).

(G) Quality. General air flow should not be turbulent and should be relatively uniform throughout the laboratory, with no high velocity or static areas (194, 195); airflow into and within the hood should not be excessively turbulent (200); hood face velocity should be adequate (typically 60-100 lfm) (200, 204).

(H) Evaluation. Quality and quantity of ventilation should be evaluated on installation (202), regularly monitored (at least every 3 months) (6, 12, 14, 195), and reevaluated whenever a change in local ventilation devices is made (12, 195, 207). See pp. 195-198 for methods of evaluation

and for calculation of estimated airborne contaminant concentrations.

(d) Components of the chemical hygiene plan:

(i) Basic rules and procedures (recommendations for these are given in section (e), below).

(ii) Chemical procurement, distribution, and storage.

(A) Procurement. Before a substance is received, information on proper handling, storage, and disposal should be known to those who will be involved (215, 216). No container should be accepted without an adequate identifying label (216). Preferably, all substances should be received in a central location (216).

(B) Stockrooms/storerooms. Toxic substances should be segregated in a well-identified area with local exhaust ventilation (221). Chemicals which are highly toxic (227) or other chemicals whose containers have been opened should be in unbreakable secondary containers (219). Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity (218-19).

(C) Stockrooms/storerooms should not be used as preparation or repackaging areas, should be open during normal working hours, and should be controlled by one person (219).

(D) Distribution. When chemicals are hand carried, the container should be placed in an outside container or bucket. Freight-only elevators should be used if possible (223).

(E) Laboratory storage. Amounts permitted should be as small as practical. Storage on bench tops and in hoods is inadvisable. Exposure to heat or direct sunlight should be avoided. Periodic inventories should be conducted, with unneeded items being discarded or returned to the storeroom/stockroom (225-6, 229).

(iii) Environmental monitoring. Regular instrumental monitoring of airborne concentrations is not usually justified or practical in laboratories but may be appropriate when testing or redesigning hoods or other ventilation devices (12) or when a highly toxic substance is stored or used regularly (e.g., 3 times/week) (13).

(iv) Housekeeping, maintenance, and inspections.

(A) Cleaning. Floors should be cleaned regularly (24).

(B) Inspections. Formal housekeeping and chemical hygiene inspections should be held at least quarterly (6, 21) for units which have frequent personnel changes and semiannually for others; informal inspections should be continual (21).

(C) Maintenance. Eye wash fountains should be inspected at intervals of not less than 3 months (6). Respirators for routine use should be inspected periodically by the laboratory supervisor (169). Safety showers should be tested routinely (169). Other safety equipment should be inspected regularly. (E.g., every 3-6 months) (6, 24, 171). Procedures to prevent restarting of out-of-service equipment should be established (25).

(D) Passageways. Stairways and hallways should not be used as storage areas (24). Access to exits, emergency equipment, and utility controls should never be blocked (24).

(v) Medical program.

(A) Compliance with regulations. Regular medical surveillance should be established to the extent required by regulations (12).

(B) Routine surveillance. Anyone whose work involves regular and frequent handling of toxicologically significant quantities of a chemical should consult a qualified physician to determine on an individual basis whether a regular schedule of medical surveillance is desirable (11, 50).

(C) First aid. Personnel trained in first aid should be available during working hours and an emergency room with medical personnel should be nearby (173). See pp. 176-178 for description of some emergency first-aid procedures.

(vi) Protective apparel and equipment. These should include for each laboratory:

(A) Protective apparel compatible with the required degree of protection for substances being handled (158-161);

(B) An easily accessible drench-type safety shower (162, 169);

(C) An eyewash fountain (162);

(D) A fire extinguisher (162-164);

(E) Respiratory protection (164-9), fire alarm and telephone for emergency use (162) should be available nearby; and

(F) Other items designated by the laboratory supervisor (156, 160).

(vii) Records.

(A) Accident records should be written and retained (174).

(B) Chemical hygiene plan records should document that the facilities and precautions were compatible with current knowledge and regulations (7).

(C) Inventory and usage records for high-risk substances should be kept as specified in sections E3e below.

(D) Medical records should be retained by the institution in accordance with the requirements of state and federal regulations (12).

(viii) Signs and labels. Prominent signs and labels of the following types should be posted:

(A) Emergency telephone numbers of emergency personnel/ facilities, supervisors, and laboratory workers (28);

(B) Identity labels, showing contents of containers (including waste receptacles) and associated hazards (27, 48);

(C) Location signs for safety showers, eyewash stations, other safety and first aid equipment, exits (27) and areas where food and beverage consumption and storage are permitted (24); and

(D) Warnings at areas or equipment where special or unusual hazards exist (27).

(ix) Spills and accidents.

(A) A written emergency plan should be established and communicated to all personnel; it should include procedures for ventilation failure (200), evacuation, medical care, reporting, and drills (172).

(B) There should be an alarm system to alert people in all parts of the facility including isolation areas such as cold rooms (172).

(C) A spill control policy should be developed and should include consideration of prevention, containment, cleanup, and reporting (175).

(D) All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit (8, 28).

(x) Information and training program.

(A) Aim: To assure that all individuals at risk are adequately informed about the work in the laboratory, its risks, and what to do if an accident occurs (5, 15).

(B) Emergency and personal protection training: Every laboratory worker should know the location and proper use of available protective apparel and equipment (154, 169).

(C) Some of the full-time personnel of the laboratory should be trained in the proper use of emergency equipment and procedures (6).

(D) Such training as well as first-aid instruction should be available to (154) and encouraged for (176) everyone who might need it.

(E) Receiving and stockroom/storeroom personnel should know about hazards, handling equipment, protective apparel, and relevant regulations (217).

(F) Frequency of training: The training and education program should be a regular, continuing activity—not simply an annual presentation (15).

(G) Literature/consultation: Literature and consulting advice concerning chemical hygiene should be readily available to laboratory personnel, who should be encouraged to use these information resources (14).

(xi) Waste disposal program.

(A) Aim: To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals (5).

(B) Content (14, 232, 233, 240): The waste disposal program should specify how waste is to be collected, segregated, stored, and transported and include consideration of what materials can be incinerated. Transport from the institution must be in accordance with DOT regulations (244).

(C) Discarding chemical stocks: Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened (24, 27).

(D) Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage (226).

(E) Frequency of disposal: Waste should be removed from laboratories to a central waste storage area at least once per week and from the central waste storage area at regular intervals (14).

(F) Method of disposal: Incineration in an environmentally acceptable manner is the most practical disposal method for combustible laboratory waste (14, 238, 241).

(G) Indiscriminate disposal by pouring waste chemicals down the drain (14, 231, 242) or adding them to mixed refuse for landfill burial is unacceptable (14).

(H) Hoods should not be used as a means of disposal for volatile chemicals (40, 200).

(I) Disposal by recycling (233, 243) or chemical decontamination (40, 230) should be used when possible.

(e) Basic rules and procedures for working with chemicals. The chemical hygiene plan should require that laboratory workers know and follow its rules and procedures. In addition to the procedures of the subprograms mentioned above, these should include the general rules following:

(i) General rules. The following should be used for essentially all laboratory work with chemicals:

(A) Accidents and spills—Eye contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention (33, 172).

(B) Ingestion: Encourage the victim to drink large amounts of water (178).

(C) Skin contact: Promptly flush the affected area with water (33, 172, 178) and remove any contaminated clothing (172, 178). If symptoms persist after washing, seek medical attention (33).

(D) Clean-up. Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal (24, 33). See pp. 233-237 for specific clean-up recommendations.

(E) Avoidance of "routine" exposure: Develop and encourage safe habits (23); avoid unnecessary exposure to chemicals by any route (23);

(F) Do not smell or taste chemicals (32). Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices (199).

(G) Inspect gloves (157) and test glove boxes (208) before use.

(H) Do not allow release of toxic substances in cold rooms and warm rooms, since these have contained recirculated atmospheres (209).

(I) Choice of chemicals: Use only those chemicals for which the quality of the available ventilation system is appropriate (13).

(J) Eating, smoking, etc.: Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present (22, 24, 32, 40); wash hands before conducting these activities (23, 24).

(K) Avoid storage, handling, or consumption of food or beverages in storage areas, refrigerators, glassware, or utensils which are also used for laboratory operations (23, 24, 226).

(L) Equipment and glassware: Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware (25). Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur (25). Use equipment only for its designed purpose (23, 26).

(M) Exiting: Wash areas of exposed skin well before leaving the laboratory (23).

(N) Horseplay: Avoid practical jokes or other behavior which might confuse, startle, or distract another worker (23).

(O) Mouth suction: Do not use mouth suction for pipetting or starting a siphon (23, 32).

(P) Personal apparel: Confine long hair and loose clothing (23, 158). Wear shoes at all times in the laboratory but do not wear sandals, perforated shoes, or sneakers (158).

(Q) Personal housekeeping: Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area on completion of an operation or at the end of each day (24).

(R) Personal protection: Assure that appropriate eye protection (154-156) is worn by all persons, including visitors, where chemicals are stored or handled (22, 23, 33, 154).

(S) Wear appropriate gloves when the potential for contact with toxic materials exists (157); inspect the gloves

before each use, wash them before removal, and replace them periodically (157). (A table of resistance to chemicals of common glove materials is given p. 159.)

(T) Use appropriate (164-168) respiratory equipment when air contaminant concentrations are not sufficiently restricted by engineering controls (164-5), inspecting the respirator before use (169).

(U) Use any other protective and emergency apparel and equipment as appropriate (22, 157-162).

(V) Void use of contact lenses in the laboratory unless necessary; if they are used, inform supervisor so special precautions can be taken (155).

(W) Remove laboratory coats immediately on significant contamination (161).

(X) Planning: Seek information and advice about hazards (7), plan appropriate protective procedures, and plan positioning of equipment before beginning any new operation (22, 23).

(Y) Unattended operations: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation (27, 128).

(Z) Use of hood: Use the hood for operations which might result in release of toxic chemical vapors or dust (198-9).

(AA) As a rule of thumb, use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm (13).

(BB) Confirm adequate hood performance before use; keep hood closed at all times except when adjustments within the hood are being made (200); keep materials stored in hoods to a minimum and do not allow them to block vents or air flow (200).

(CC) Leave the hood "on" when it is not in active use if toxic substances are stored in it or if it is uncertain whether adequate general laboratory ventilation will be maintained when it is "off" (200).

(DD) Vigilance: Be alert to unsafe conditions and see that they are corrected when detected (22).

(EE) Waste disposal: Assure that the plan for each laboratory operation includes plans and training for waste disposal (230).

(FF) Deposit chemical waste in appropriately labeled receptacles and follow all other waste disposal procedures of the chemical hygiene plan (22, 24).

(GG) Do not discharge to the sewer concentrated acids or bases (231); highly toxic, malodorous, or lachrymatory substances (231); or any substances which might interfere with the biological activity of waste water treatment plants, create fire or explosion hazards, cause structural damage, or obstruct flow (242).

(HH) Working alone: Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous (28).

(ii) Working with allergens and embryotoxins.

(A) Allergens (examples: Diazomethane, isocyanates, bichromates): Wear suitable gloves to prevent hand contact with allergens or substances of unknown allergenic activity (35).

(B) Embryotoxins (34-5) (examples: Organomercurials, lead compounds, formamide): Women of childbearing age shall handle these substances only in a hood whose satisfactory performance has been confirmed, using appropriate protective apparel (especially gloves) to prevent skin contact.

(C) Review each use of these materials with the research supervisor and review continuing uses annually or whenever a procedural change is made.

(D) Store these substances, properly labeled, in an adequately ventilated area in an unbreakable secondary container.

(E) Notify supervisors of all incidents of exposure or spills; consult a qualified physician when appropriate.

(iii) Work with chemicals of moderate chronic or high acute toxicity.

Examples: diisopropylfluorophosphate (41), hydrofluoric acid (43), hydrogen cyanide (45).

(iv) Supplemental rules to be followed in addition to those mentioned above (Procedure B of "prudent practices," pp. 39-41):

(A) Aim: To minimize exposure to these toxic substances by any route using all reasonable precautions (39).

(B) Applicability: These precautions are appropriate for substances with moderate chronic or high acute toxicity used in significant quantities (39).

(C) Location: Use and store these substances only in areas of restricted access with special warning signs (40, 229).

(D) Always use a hood (previously evaluated to confirm adequate performance with a face velocity of at least 60 linear feet per minute) (40) or other containment device for procedures which may result in the generation of aerosols or vapors containing the substance (39); trap released vapors to prevent their discharge with the hood exhaust (40).

(E) Personal protection: Always avoid skin contact by use of gloves and long sleeves (and other protective apparel as appropriate) (39). Always wash hands and arms immediately after working with these materials (40).

(F) Records: Maintain records of the amounts of these materials on hand, amounts used, and the names of the workers involved (40, 229).

(G) Prevention of spills and accidents: Be prepared for accidents and spills (41).

(H) Assure that at least 2 people are present at all times if a compound in use is highly toxic or of unknown toxicity (39).

(I) Store breakable containers of these substances in chemically resistant trays; also work and mount apparatus above such trays or cover work and storage surfaces with removable, absorbent, plastic backed paper (40).

(J) If a major spill occurs outside the hood, evacuate the area; assure that cleanup personnel wear suitable protective apparel and equipment (41).

(K) Waste: Thoroughly decontaminate or incinerate contaminated clothing or shoes (41). If possible, chemically decontaminate by chemical conversion (40).

(L) Store contaminated waste in closed, suitably labeled, impervious containers (for liquids, in glass or plastic bottles half-filled with vermiculite) (40).

(v) Work with chemicals of high chronic toxicity.

Examples: Dimethylmercury and nickel carbonyl (48), benzo-a-pyrene (51), N-nitrosodiethylamine (54), other human carcinogens or substances with high carcinogenic potency in animals (38).

(vi) Further supplemental rules to be followed, in addition to all these mentioned above, for work with substances of known high chronic toxicity (in quantities above a few milligrams to a few grams, depending on the substance) (47). (Procedure A of "Prudent Practices" pp. 47-50).

(A) Access: Conduct all transfers and work with these substances in a "controlled area": A restricted access hood, glove box, or portion of a lab, designated for use of highly toxic substances, for which all people with access are aware of the substances being used and necessary precautions (48).

(B) Approvals: Prepare a plan for use and disposal of these materials and obtain the approval of the laboratory supervisor (48).

(C) Noncontamination/decontamination: Protect vacuum pumps against contamination by scrubbers or HEPA filters and vent them into the hood (49). Decontaminate vacuum pumps or other contaminated equipment, including glassware, in the hood before removing them from the controlled area (49, 50).

(D) Decontaminate the controlled area before normal work is resumed there (50).

(E) Exiting: On leaving a controlled area, remove any protective apparel (placing it in an appropriate, labeled container) and thoroughly wash hands, forearms, face, and neck (49).

(F) Housekeeping: Use a wet mop or a vacuum cleaner equipped with a HEPA filter instead of dry sweeping if the toxic substance was a dry powder (50).

(G) Medical surveillance: If using toxicologically significant quantities of such a substance on a regular basis (e.g., 3 times per week), consult a qualified physician concerning desirability of regular medical surveillance (50).

(H) Records: Keep accurate records of the amounts of these substances stored (229) and used, the dates of use, and names of users (48).

(I) Signs and labels: Assure that the controlled area is conspicuously marked with warning and restricted access signs (49) and that all containers of these substances are appropriately labeled with identity and warning labels (48).

(J) Spills: Assure that contingency plans, equipment, and materials to minimize exposures of people and property in case of accident are available (233-4).

(K) Storage: Store containers of these chemicals only in a ventilated, limited access (48, 227, 229) area in appropriately labeled, unbreakable, chemically resistant, secondary containers (48, 229).

(L) Glove boxes: For a negative pressure glove box, ventilation rate must be at least 2 volume changes/hour and pressure at least 0.5 inches of water (48). For a positive pressure glove box, thoroughly check for leaks before each use (49). In either case, trap the exit gases or filter them through a HEPA filter and then release them into the hood (49).

(M) Waste: Use chemical decontamination whenever possible; ensure that containers of contaminated waste (including washings from contaminated flasks) are trans-

ferred from the controlled area in a secondary container under the supervision of authorized personnel (49, 50, 233).

(vii) Animal work with chemicals of high chronic toxicity.

(A) Access: For large scale studies, special facilities with restricted access are preferable (56).

(B) Administration of the toxic substance: When possible, administer the substance by injection or gavage instead of in the diet. If administration is in the diet, use a caging system under negative pressure or under laminar air flow directed toward HEPA filters (56).

(C) Aerosol suppression: Devise procedures which minimize formation and dispersal of contaminated aerosols, including those from food, urine, and feces (e.g., use HEPA filtered vacuum equipment for cleaning, moisten contaminated bedding before removal from the cage, mix diets in closed containers in a hood) (55, 56).

(D) Personal protection: When working in the animal room, wear plastic or rubber gloves, fully buttoned laboratory coat or jumpsuit and, if needed because of incomplete suppression of aerosols, other apparel and equipment (shoe and head coverings, respirator) (56).

(E) Waste disposal: Dispose of contaminated animal tissues and excreta by incineration if the available incinerator can convert the contaminant to nontoxic products (238); otherwise, package the waste appropriately for burial in an EPA-approved site (239).

(f) Safety recommendations. The above recommendations from "prudent practices" do not include those which are directed primarily toward prevention of physical injury rather than toxic exposure. However, failure of precautions against injury will often have the secondary effect of causing toxic exposures. Therefore, we list below page references for recommendations concerning some of the major categories of safety hazards which also have implications for chemical hygiene:

(i) Corrosive agents: (35-6)

(ii) Electrically powered laboratory apparatus: (179-92)

(iii) Fires, explosions: (26, 57-74, 162-4, 174-5, 219-20, 226-7)

(iv) Low temperature procedures: (26, 88)

(v) Pressurized and vacuum operations (including use of compressed gas cylinders): (27, 75-101)

(g) Material safety data sheets. Material safety data sheets are presented in "prudent practices" for the chemicals listed below. (Asterisks denote that comprehensive material safety data sheets are provided.)

*Acetyl peroxide (105) *Acrolein (106) *Acrylonitrile (107) Ammonia (anhydrous) (91) *Aniline (109) *Benzene (110) *Benzo[a]pyrene (112) *Bis(chloromethyl) ether (113) Boron trichloride (91) Boron trifluoride (92) Bromine (114) *Tert-butyl hydroperoxide (148) *Carbon disulfide (116) Carbon monoxide (92) *Carbon tetrachloride (118) *Chlorine (119) Chlorine trifluoride (94) *Chloroform (121) Chloromethane (93) *Diethyl ether (122) Diisopropyl fluorophosphate (41) *Dimethylformamide (123) *Dimethyl sulfate (125) *Dioxane (126) *Ethylene dibromide (128) *fluorine (95) *Formaldehyde (130) *Hydrazine and salts (132) Hydrofluoric acid (43) Hydrogen bromide (98) Hydrogen chloride (98) *Hydrogen cyanide (133) *Hydrogen sulfide

(135) Mercury and compounds (52) *Methanol (137) *Morpholine (138) *Nickel carbonyl (99) *Nitrobenzene (139) Nitrogen dioxide (100) N-nitrosodiethylamine (54) *Peracetic acid (141) *Phenol (142) *Phosgene (143) *Pyridine (144) *Sodium azide (145) *Sodium cyanide (147) Sulfur dioxide (101) *Trichloroethylene (149) *Vinyl chloride (150)

[Statutory Authority: Chapter 49.17 RCW. 94-15-096 (Order 94-07), § 296-62-40025, filed 7/20/94, effective 9/20/94; 90-17-051 (Order 90-10), § 296-62-40025, filed 8/13/90, effective 9/24/90.]

WAC 296-62-40027 Appendix B—References (non-mandatory). (1) The following references are provided to assist the employer in the development of a chemical hygiene plan. The materials listed below are offered as nonmandatory guidance. References listed here do not imply specific endorsement of a book, opinion, technique, policy, or a specific solution for a safety or health problem. Other references not listed here may better meet the needs of a specific laboratory. Reference materials for the development of the chemical hygiene plan are:

(a) *American Chemical Society, Safety in Academic Chemistry Laboratories, 4th edition, 1985.*

(b) *Fawcett, H.H. and W. S. Wood, Safety and Accident Prevention in Chemical Operations, 2nd edition, Wiley-Interscience, New York, 1982.*

(c) *Flury, Patricia A., Environmental Health and Safety in the Hospital Laboratory, Charles C. Thomas Publisher, Springfield IL, 1978.*

(d) *Green, Michael E. and Turk, Amos, Safety in Working with Chemicals, Macmillan Publishing Co., NY, 1978.*

(e) *Kaufman, James A., Laboratory Safety Guidelines, Dow Chemical Co., Box 1713, Midland, MI 48640, 1977.*

(f) *National Institutes of Health, NIH Guidelines for the Laboratory use of Chemical Carcinogens, NIH Pub. No. 81-2385, GPO, Washington, DC 20402, 1981.*

(g) *National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, National Academy Press, Washington, DC, 1983.*

(h) *National Research Council, Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academy Press, Washington, DC, 1981.*

(i) *Renfrew, Malcolm, Ed., Safety in the Chemical Laboratory, Vol. IV, J. Chem. Ed., American Chemical Society, Easton, PA, 1981.*

(j) *Steere, Norman V., Ed., Safety in the Chemical Laboratory, J. Chem. Ed. American Chemical Society, Easton, PA, 18042, Vol. I, 1967, Vol. II, 1971, Vol. III 1974.*

(k) *Steere, Norman V., Handbook of Laboratory Safety, the Chemical Rubber Company Cleveland, OH, 1971.*

(l) *Young, Jay A., Ed., Improving Safety in the Chemical Laboratory, John Wiley & Sons, Inc. New York, 1987.*

(2) Hazardous substances information:

(a) *American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes, P.O. Box 1937 Cincinnati, OH 45201 (latest edition).*

(b) *Annual Report on Carcinogens, National Toxicology Program U.S. Department of Health and Human Services, Public Health Service, U.S. Government Printing Office, Washington, DC, (latest edition).*

(c) *Best Company, Best Safety Directory, Vols. I and II, Oldwick, N.J., 1981.*

(d) *Bretherick, L., Handbook of Reactive Chemical Hazards, 2nd edition, Butterworths, London, 1979.*

(e) *Bretherick, L., Hazards in the Chemical Laboratory, 3rd edition, Royal Society of Chemistry, London, 1986.*

(f) *Code of Federal Regulations, 29 CFR part 1910 subpart Z. U.S. Govt. Printing Office, Washington, DC 20402 (latest edition).*

(g) *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, World Health Organization Publications Center, 49 Sheridan Avenue, Albany, New York 12210 (latest editions).*

(h) *NIOSH/OSHA Pocket Guide to Chemical Hazards. NIOSH Pub. No. 85-114, U.S. Government Printing Office, Washington, DC, 1985 (or latest edition).*

(i) *Occupational Health Guidelines, NIOSH/OSHA NIOSH Pub. No. 81-123 U.S. Government Printing Office, Washington, DC, 1981.*

(j) *Patty, F.A., Industrial Hygiene and Toxicology, John Wiley & Sons, Inc., New York, NY (Five Volumes).*

(k) *Registry of Toxic Effects of Chemical Substances, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, Revised Annually, for sale from Superintendent of Documents U.S. Govt. Printing Office, Washington, DC 20402.*

(l) *The Merck Index: An Encyclopedia of Chemicals and Drugs. Merck and Company Inc. Rahway, N.J., 1976 (or latest edition).*

(m) *Sax, N.I. Dangerous Properties of Industrial Materials, 5th edition, Van Nostrand Reinhold, NY., 1979.*

(n) *Sittig, Marshall, Handbook of Toxic and Hazardous Chemicals, Noyes Publications, Park Ridge, NJ, 1981.*

(3) Information on ventilation:

(a) *American Conference of Governmental Industrial Hygienists Industrial Ventilation, 16th edition Lansing, MI, 1980.*

(b) *American National Standards Institute, Inc. American National Standards Fundamentals Governing the Design and Operation of Local Exhaust Systems ANSI Z 9.2-1979 American National Standards Institute, N.Y. 1979.*

(c) *Imad, A.P. and Watson, C.L. Ventilation Index: An Easy Way to Decide about Hazardous Liquids, Professional Safety pp 15-18, April 1980.*

(d) *National Fire Protection Association, Fire Protection for Laboratories Using Chemicals NFPA-45, 1982.*

(e) *Safety Standard for Laboratories in Health Related Institutions, NFPA, 56c, 1980.*

(f) *Fire Protection Guide on Hazardous Materials, 7th edition, 1978.*

(g) *National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.*

(h) *Scientific Apparatus Makers Association (SAMA), Standard for Laboratory Fume Hoods, SAMA LF7-1980, 1101 16th Street, NW., Washington, DC 20036.*

(4) Information on availability of referenced material:

(a) *American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.*

(b) *American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103. (Approved by the Office of Management and Budget under control number 1218-0131.)*

[Statutory Authority: Chapter 49.17 RCW, 90-17-051 (Order 90-10), § 296-62-40027, filed 8/13/90, effective 9/24/90.]

PART R—EMERGENCY RESPONSE TO HAZARDOUS SUBSTANCE RELEASE

WAC 296-62-410 Emergency response to hazardous substance release.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-410, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41001 Scope and application. (1) Scope. This section covers employers who have employees who work in emergency response operations for the releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

(2) Application. All requirements of this chapter and chapters 296-24 and 296-155 WAC apply under their terms to emergency response operations whether covered by this part or not. If there is a conflict or overlap, the provision more protective of employee safety and health must apply.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-41001, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41003 Definitions. "Buddy system" means a system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

"Clean-up operation" means an operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment.

"Decontamination" means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.

"Emergency response" or "responding to emergencies" means a response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area or by maintenance personnel are not considered to be emer-

gency responses within the scope of this standard. Responses to release of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses.

"Facility" means:

Any building structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly-owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft; or

Any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

"Hazardous materials response (HAZMAT) team" means an organized group of employees, designated by the employer, who are expected to perform work, to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. The team members perform responses to releases or potential releases of hazardous substances for the purpose of control or stabilization of the incident. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade or fire department.

"Hazardous substance" means any substance designated or listed under this definition, exposure to which results or may result in adverse effects on the health or safety of employees:

Any substance defined under section 101(14) of CERCLA;

Any biological agent and other disease-causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring;

Any substance listed by the United States Department of Transportation as hazardous materials under WAC 480-12-195; and

Hazardous waste.

"Hazardous waste" means: A waste or combination of wastes as defined in this section.

"Hazardous waste operation" means any operation conducted within the scope of chapter 296-62 WAC, Part P.

"Health hazard" means a chemical, mixture of chemicals, or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes. Further

definition of the terms used above can be found in Appendix A to chapter 296-62 WAC, Part C.

"IDLH" or "immediately dangerous to life or health" means any atmospheric concentration of any toxic, corrosive, or asphyxiant substance that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

"Oxygen deficiency" means that concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

"Permissible exposure limit" means the exposure, inhalation, or dermal permissible limit specified in WAC 296-62-075 through 296-62-07515.

"Published exposure level" means the exposure limits published in "*NIOSH Recommendations for Occupational Health Standards*" dated 1986 incorporated by reference, or if none is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication "*Threshold Limit Values and Biological Exposure Indices for 1988-89*" dated 1988 incorporated by reference.

"Post emergency response" means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by an employer's own employees who were part of the initial emergency response, it is considered to be part of the initial response and not post emergency response. However, if a group of an employer's own employees, separate from the group providing initial response, performs the clean-up operation, then the separate group of employees would be considered to be performing post-emergency response and subject to WAC 296-62-41060.

"Qualified person" means a person with specific training, knowledge, and experience in the area for which the person has responsibility and the authority to control.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41003, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41010 Emergency response. This section covers employers whose employees are engaged in emergency response no matter where it occurs except that it does not cover employees engaged in operations specified in WAC 296-62-300 (1)(a) through (d).

Those emergency response organizations who have developed and implemented programs equivalent to this section for handling releases of hazardous substances under Section 303 of SARA Title III must be deemed to have met the requirements of this section.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41010, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41011 Emergency response plan. An emergency response plan must be developed and implemented to handle anticipated emergencies before the commencement of emergency response operations. The plan must be in writing and available for inspection and copying

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by employees, their representatives, and WISHA personnel. Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this section if they provide an emergency action plan in accordance with WAC 296-24-567(1).

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41011, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41013 Elements of an emergency response plan. The employer must develop an emergency response plan for emergencies which must address, as a minimum, the following to the extent that they are not addressed elsewhere:

- (1) Preemergency planning and coordination with outside parties.
- (2) Personnel roles, lines of authority, training, and communication.
- (3) Emergency recognition and prevention.
- (4) Safe distances and places of refuge.
- (5) Site security and control.
- (6) Evacuation routes and procedures.
- (7) Decontamination.
- (8) Emergency medical treatment and first aid.
- (9) Emergency alerting and response procedures.
- (10) Critique of response and follow-up.
- (11) PPE and emergency equipment.

(12) Emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency response plan to avoid duplication. Those items of the emergency response plan that are being properly addressed by the SARA Title III plans may be substituted into their emergency plan or otherwise kept together for the employer and employee's use.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41013, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41015 Procedures for handling emergency response. (1) The senior emergency response official responding to an emergency must become the individual in charge of a site-specific incident command system (ICS). All emergency responders and their communications must be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

Note: The "senior official" at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e., battalion chief, fire chief, state law enforcement official, site coordinator, etc.), the position is passed up the line of authority which has been previously established.

(2) The individual in charge of the ICS must identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous

substance handling procedures, and use of any new technologies.

(3) Based on the hazardous substances and/or conditions present, the individual in charge of the ICS must implement appropriate emergency operations, and assure that the personal protective equipment worn is appropriate for the hazards to be encountered. However, personal protective equipment must meet, at a minimum, the criteria contained in WAC 296-24-58513 when worn while performing fire fighting operations beyond the incipient stage for any incident.

(4) Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard must wear positive pressure self-contained breathing apparatus, until the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

(5) The individual in charge of the ICS must limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. However, operations in hazardous areas must be performed using the buddy system in groups of two or more.

(6) Back-up personnel must stand by with equipment ready to provide assistance or rescue. Advance first-aid support personnel, as a minimum, must also stand by with medical equipment and transportation capability.

(7) The individual in charge of the ICS must designate a safety official, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand.

(8) When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, the safety official must have the authority to alter, suspend, or terminate those activities. The safety official must immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene.

(9) After emergency operations have terminated, the individual in charge of the ICS must implement appropriate decontamination procedures.

(10) When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus must meet United States Department of Transportation and National Institute for Occupational Safety and Health criteria.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41015, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41017 Skilled support personnel. Personnel, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and

hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this subsection for the employer's regular employees. However, these personnel must be given an initial briefing at the site before their participation in any emergency response. The initial briefing must include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All other appropriate safety and health precautions provided to the employer's own employees must be used to assure the safety and health of these personnel.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41017, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41019 Specialist employees. Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, must receive training or demonstrate competency in the area of their specialization annually.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41019, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41020 Training.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41020, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41021 Training before participation. Training must be based on the duties and functions to be performed by each responder of an emergency response organization. The skill and knowledge levels required for all new responders, those hired after the effective date of this standard, must be conveyed to them through training before they are permitted to take part in actual emergency operations on an incident.

Employees who participate, or are expected to participate, in emergency response, must be given training in accordance with the following:

(1) First responder awareness level. First responders at the awareness level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities of the release. First responders at the awareness level must have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

(a) An understanding of what hazardous substances are and the risks associated with them in an incident.

(b) An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.

(c) The ability to recognize the presence of hazardous substances in an emergency.

(d) The ability to identify the hazardous substances, if possible.

(e) An understanding of the role of the first responder awareness individual in the employer's emergency response plan including site security and control and the United States Department of Transportation's Emergency Response Guidebook.

(f) The ability to realize the need for additional resources and to make appropriate notifications to the communication center.

(2) First responder operations level. First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and protect exposures. First responders at the operational level must have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer must so certify:

(a) Knowledge of the basic hazard and risk assessment techniques.

(b) Know how to select and use proper personal protective equipment provided to the first responder operational level.

(c) An understanding of basic hazardous materials terms.

(d) Know how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit.

(e) Know how to implement basic decontamination procedures.

(f) An understanding of the relevant standard operating procedures and termination procedures.

(3) Hazardous materials technician. Hazardous materials technicians are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of hazardous substance. Hazardous materials technicians must have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer must so certify:

(a) Know how to implement the employer's emergency response plan.

(b) Know the classification, identification, and verification of known and unknown materials by using field survey instruments and equipment.

(c) Be able to function within an assigned role in the incident command system.

(d) Know how to select and use proper specialized chemical personal protective equipment provided to the hazardous materials technician.

(e) Understand hazard and risk assessment techniques.

(f) Be able to perform advance control, containment, and/or confinement operations within the capabilities of the

resources and personal protective equipment available with the unit.

(g) Understand and implement decontamination procedures.

(h) Understand termination procedures.

(i) Understand basic chemical and toxicological terminology and behavior.

(4) Hazardous materials specialist. Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician, however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with federal, state, local, and other government authorities in regard to site activities.

Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer must so certify:

(a) Know how to implement the local emergency response plan.

(b) Understand classification, identification, and verification of known and unknown materials by using advanced survey instruments and equipment.

(c) Know of the state emergency response plan.

(d) Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist.

(e) Understand in-depth hazard and risk techniques.

(f) Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available.

(g) Be able to determine and implement decontamination procedures.

(h) Have the ability to develop a site safety and control plan.

(i) Understand chemical, radiological, and toxicological terminology and behavior.

(5) On scene incident commander. Incident commanders, who will assume control of the incident scene beyond the first responder awareness level, must receive at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer must so certify:

(a) Know and be able to implement the employer's incident command system.

(b) Know how to implement the employer's emergency response plan.

(c) Know and understand the hazards and risks associated with employees working in chemical protective clothing.

(d) Know how to implement the local emergency response plan.

(e) Know of the state emergency response plan and of the Federal Regional Response Team.

(f) Know and understand the importance of decontamination procedures.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-41021, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41023 Trainers. Trainers who teach any of the above training subjects must have satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered by the United States National Fire Academy, or they must have the training and/or academic credentials and instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41023, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41025 Refresher training. (1) Those employees who are trained in accordance with WAC 296-62-41020 must receive annual refresher training of sufficient content and duration to maintain their competencies, or must demonstrate competency in those areas at least yearly.

(2) A statement must be made of the training or competency, and if a statement of competency is made, the employer must keep a record of the methodology used to demonstrate competency.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-17-094, § 296-62-41025, filed 8/17/99, effective 12/1/99. Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41025, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41030 Employee personal protective equipment.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41030, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41031 Personal protective equipment selection. (1) Personal protective equipment (PPE) must be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis.

(2) Personal protective equipment selection must be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

(3) Positive pressure self-contained breathing apparatus, or positive pressure air-line respirators equipped with an escape air supply must be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(4) Totally encapsulating chemical protective suits (protection equivalent to Level A protection as recommended in Appendix B) must be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(5) The level of protection provided by PPE selection must be increased when additional information or site conditions indicate that increased protection is necessary to reduce employee exposures below permissible exposure limits and published exposure levels for hazardous substances and health hazards. (See WAC 296-62-41082 - Appendix B for guidance on selecting PPE ensembles.)

[Title 296 WAC—p. 1866]

Note: The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in increased hazardous exposures to employees.

(6) Personal protective equipment must be selected and used to meet the requirements of chapter 296-24 WAC, Part A-2, and additional requirements specified in this part.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41031, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41033 Totally encapsulating chemical protective suits. (1) Totally encapsulating suits must protect employees from the particular hazards which are identified during site characterization and analysis.

(2) Totally encapsulating suits must be capable of maintaining positive air pressure. (See WAC 296-62-41081 - Appendix A for a test method which may be used to evaluate this requirement.)

(3) Totally encapsulating suits must be capable of preventing inward test gas leakage of more than 0.5 percent. (See WAC 296-62-41081 - Appendix A for a test method which may be used to evaluate this requirement.)

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41033, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41035 Personal protective equipment (PPE) program. A written personal protective equipment program, which is part of the emergency response plan required in WAC 296-62-41011 must be established. The PPE program must address the elements listed below. When elements, such as donning and doffing procedures, are provided by the manufacturer of a piece of equipment and are attached to the plan, they need not be rewritten into the plan as long as they adequately address the procedure or element.

- (1) PPE selection based on site hazards,
- (2) PPE use and limitations of the equipment,
- (3) Work mission duration,
- (4) PPE maintenance and storage,
- (5) PPE decontamination and disposal,
- (6) PPE training and proper fitting,
- (7) PPE donning and doffing procedures,
- (8) PPE inspection procedures before, during, and after use,
- (9) Evaluation of the effectiveness of the PPE program, and
- (10) Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41035, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41040 Medical surveillance and consultation for emergency response.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41040, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41041 Employees covered. The medical surveillance program must be instituted by the employer for the following employees:

(1) All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;

(2) Members of an organized and designated HAZMAT team and hazardous materials specialists must receive a baseline physical examination and be provided with medical surveillance.

(3) Any emergency response employees who exhibit signs or symptoms which may have resulted from exposure to hazardous substances during the course of an emergency incident, either immediately or subsequently, must be provided with medical consultation as required in WAC 296-62-41041(2).

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41041, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41042 Frequency of medical examinations and consultations. Medical examinations and consultations must be made available by the employer to each employee covered under subsection (1) of this section on the following schedules:

(1) For employees covered under WAC 296-62-41041 (1) and (2):

(a) Before assignment;

(b) At least once every twelve months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate;

(c) At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months;

(d) As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limits, or published exposure levels in an emergency situation;

(e) At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

(2) For employees covered under WAC 296-62-41042 (1)(c) and for all employees including those employees covered by chapter 296-62 WAC, Part R who may have been injured, received a health impairment, developed signs or symptoms which may have resulted from exposure to hazardous substances resulting from an emergency incident, or exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits or the published exposure levels without the necessary personal protective equipment being used:

(a) As soon as possible following the emergency incident or development of signs or symptoms;

(b) At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41042, filed 3/23/99, effective 6/23/99.]

(2001 Ed.)

WAC 296-62-41043 Content of medical examinations and consultations. (1) Medical examinations required by WAC 296-62-41042 must include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the worksite.

(2) The content of medical examinations or consultations made available to employees under this section shall be determined by the examining physician. The guidelines in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (see Appendix D, Reference #10) should be consulted.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41043, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41044 Examination by a physician and costs. All medical examinations and procedures must be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and must be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41044, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41045 Information provided to the physician. The employer must provide one copy of this standard and its appendices to the examining physician, and in addition, the following for each employee:

(1) A description of the employee's duties as they relate to the employee's exposures;

(2) The employee's exposure levels or anticipated exposure levels;

(3) A description of any personal protective equipment used or to be used;

(4) Information from previous medical examinations of the employee which is not readily available to the examining physician; and

(5) Information required in WAC 296-62-071 through 296-62-07121.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41045, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41046 Physician's written opinion. (1) The employer must obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

(a) The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response or from respirators use.

(b) The physician's recommended limitations upon the employees assigned work.

(c) The results of the medical examination and tests if requested by the employee.

(d) A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(2) The written opinion obtained by the employer must not reveal specific findings or diagnoses unrelated to occupational exposures.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41046, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41047 Recordkeeping of medical surveillance activities. (1) An accurate record of the medical surveillance required by this section must be retained. This record must be retained for the period specified and meet the criteria of chapter 296-62 WAC, Part B.

(2) The record required in (a) of this subsection must include at least the following information:

(a) The name and Social Security number of the employee;

(b) Physicians' written opinions, recommended limitations, and results of examinations and tests;

(c) Any employee medical complaints related to exposure to hazardous substances;

(d) A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41047, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41060 Post emergency response operations.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41060, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41061 Removal of hazardous substances. Upon completion of the emergency response, if it is determined that it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the employer conducting the clean-up must comply with chapter 296-62 WAC, Part P.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41061, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41063 Employees training and protective equipment. Where the clean-up is done on plant property using plant or workplace employees, such employees must have completed the training requirements of WAC 296-24-567(1), 296-62-071, and 296-62-054, and other appropriate safety and health training made necessary by the tasks that they are expected to be performed such as personal protective equipment and decontamination procedures. All equipment to be used in the performance of the clean-up work must be in serviceable condition and must have been inspected before use.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41063, filed 3/23/99, effective 6/23/99.]

[Title 296 WAC—p. 1868]

WAC 296-62-41080 Appendices to Part R—Emergency response.

Note: The following appendices serve as nonmandatory guidelines to assist employees and employers in complying with the appropriate requirements of this part. However, WAC 296-62-41030 makes mandatory in certain circumstances the use of Level A and Level B personal protective equipment protection.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41080, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41081 Appendix A—Personal protective equipment test methods. This appendix sets forth the nonmandatory examples of tests which may be used to evaluate compliance with WAC 296-62-41030. Other tests and other challenge agents may be used to evaluate compliance.

(1) Totally encapsulating chemical protective suit pressure test.

(a) Scope.

(i) This practice measures the ability of a gas tight totally encapsulating chemical protective suit material, seams, and closures to maintain a fixed positive pressure. The results of this practice allow the gas tight integrity of a total-encapsulating chemical protective suit to be evaluated.

(ii) Resistance of the suit materials to permeation, penetration, and degradation by specific hazardous substances is not determined by this test method.

(b) Definition of terms.

(i) "Totally encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.

(ii) "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

(iii) "Gas tight" means for the purpose of this test method the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

(c) Summary of test method. The TECP suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pretest suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes. If the pressure drop is excessive, the TECP suit fails the test and is removed from service. The test is repeated after leak location and repair.

(d) Required supplies.

(i) Source of compressed air.

(ii) Test apparatus for suit testing including a pressure measurement device with a sensitivity of at least 1/4 inch water gauge.

(iii) Vent valve closure plugs or sealing tape.

(iv) Soapy water solution and soft brush.

(v) Stopwatch or appropriate timing device.

(e) Safety precautions. Care must be taken to provide the correct pressure safety devices required for the source of compressed air used.

(f) Test procedure. Before each test, the tester shall perform a visual inspection of the suit. Check the suit for seam integrity by visually examining the seams and gently pulling on the seams. Ensure that all air supply lines, fittings, visor, zippers, and valves are secure and show no signs of deterioration.

(i) Seal off the vent valves along with any other normal inlet or exhaust points (such as umbilical air line fittings or facepiece opening) with tape or other appropriate means (caps, plugs, fixture, etc.). Care should be exercised in the sealing process not to damage any of the suit components.

(ii) Close all closure assemblies.

(iii) Prepare the suit for inflation by providing an improvised connection point on the suit for connecting an airline. Attach the pressure test apparatus to the suit to permit suit inflation from a compressed air source equipped with a pressure indicating regulator. The leak tightness of the pressure test apparatus should be tested before and after each test by closing off the end of the tubing attached to the suit and assuring a pressure of three inches water gauge for three minutes can be maintained. If a component is removed for the test, that component must be replaced and a second test conducted with another component removed to permit a complete test of the ensemble.

(iv) The pretest expansion pressure (A) and the suit test pressure (B) must be supplied by the suit manufacturer, but in no case must they be less than (A) = 3 inches water gauge and (B) = 2 inches water gauge. The ending suit pressure (C) must be no less than eighty percent of the test pressure (B); i.e., the pressure drop must not exceed twenty percent of the test pressure (B).

(v) Inflate the suit until the pressure inside is equal to pressure (A), the pretest expansion suit pressure. Allow at least one minute to fill out the wrinkles in the suit. Release sufficient air to reduce the suit pressure to pressure (B), the suit test pressure. Begin timing. At the end of three minutes, record the suit pressure as pressure (C), the ending suit pressure. The difference between the suit test pressure and the ending suit test pressure (B)-(C) must be defined as the suit pressure drop.

(vi) If the suit pressure drop is more than twenty percent of the suit test pressure (B) during the three minute test period, the suit fails the test and must be removed from service.

(g) Retest procedure.

(i) If the suit fails the test check for leaks by inflating the suit to pressure (A) and brushing or wiping the entire suit (including seams, closures, lens gaskets, glove-to-sleeve joints, etc.) with a mild soap and water solution. Observe the suit for the formation of soap bubbles, which is an indication of a leak. Repair all identified leaks.

(ii) Retest the TECP suit as outlined in (f) of this subsection.

(h) Report. Each TECP suit tested by this practice must have the following information recorded.

(i) Unique identification number, identifying brand name, date of purchase, material of construction, and unique fit features; e.g., special breathing apparatus.

(ii) The actual values for test pressures (A), (B), and (C) must be recorded along with the specific observation times. If the ending pressure (C) is less than eighty percent of the test pressure (B), the suit shall be identified as failing the test. When possible, the specific leak location shall be identified in the test records. Retest pressure data must be recorded as an additional test.

(iii) The source of the test apparatus used must be identified and the sensitivity of the pressure gauge must be recorded.

(iv) Records must be kept for each pressure test even if repairs are being made at the test location.

Caution: Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked. Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

(2) Totally encapsulating chemical protective suit qualitative leak test.

(a) Scope.

(i) This practice semiquantitatively tests gas tight totally encapsulating chemical protective suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit.

(ii) Resistance of the suit materials to permeation, penetration, and degradation is not determined by this test method. ASTM test methods are available to test suit materials for those characteristics and the tests are usually conducted by the manufacturers of the suits.

(b) Definition of terms.

(i) "Totally encapsulated chemical protective suit (TECP suit)" means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.

(ii) "Protective clothing material" means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

(iii) "Gas tight" means for the purpose of this test method the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

(iv) "Intrusion coefficient." A number expressing the level of protection provided by a gas tight totally encapsulating chemical protective suit. The intrusion coefficient is calculated by dividing the test room challenge agent concentration by the concentration of challenge agent found inside the suit. The accuracy of the intrusion coefficient is dependent on the challenge agent monitoring methods. The larger the

intrusion coefficient, the greater the protection provided by the TECP suit.

(c) Summary of recommended practice. The volume of concentrated aqueous ammonia solution (ammonia hydroxide, NH_4OH) required to generate the test atmosphere is determined using the directions outlined in WAC 296-62-41081 (2)(f)(i). The suit is donned by a person wearing the appropriate respiratory equipment (either a positive pressure self-contained breathing apparatus or a supplied air respirator) and worn inside the enclosed test room. The concentrated aqueous ammonia solution is taken by the suited individual into the test room and poured into an open plastic pan. A two-minute evaporation period is observed before the test room concentration is measured using a high range ammonia length of stain detector tube. When the ammonia reaches a concentration of between 1000 and 1200 ppm, the suited individual starts a standardized exercise protocol to stress and flex the suit. After this protocol is completed the test room concentration is measured again. The suited individual exits the test room and his stand-by person measures the ammonia concentration inside the suit using a low range ammonia length of stain detector tube or other more sensitive ammonia detector. A stand-by person is required to observe the test individual during the test procedure, aid the person in donning and doffing the TECP suit and monitor the suit interior. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration. A colorimetric indicator strip of bromophenol blue is placed on the inside of the suit facepiece lens so that the suited individual is able to detect a color change and know if the suit has a significant leak. If a color change is observed the individual should leave the test room immediately.

(d) Required supplies.

(i) A supply of concentrated aqueous ammonium hydroxide, 58% by weight.

(ii) A supply of bromophenol/blue indicating paper, sensitive to 5-10 ppm ammonia or greater over a two-minute period of exposure [pH 3.0 (yellow) to pH 4.6 (blue)].

(iii) A supply of high range (0.5-10 volume percent) and low range (5-700 ppm) detector tubes for ammonia and the corresponding sampling pump. More sensitive ammonia detectors can be substituted for the low range detector tubes to improve the sensitivity of this practice.

(iv) A shallow plastic pan (PVC) at least 12":14":1" and a half pint plastic container (PVC) with tightly closing lid.

(v) A graduated cylinder or other volumetric measuring device of at least fifty milliliters in volume with an accuracy of at least ± 1 milliliters.

(e) Safety precautions.

(i) Concentrated aqueous ammonium hydroxide, NH_4OH is a corrosive volatile liquid requiring eye, skin, and respiratory protection. The person conducting the test must review the MSDS for aqueous ammonia.

(ii) Since the established permissible exposure limit for ammonia is 35 ppm as a 15 minute STEL, only persons wearing a positive pressure self-contained breathing apparatus or a supplied air respirator shall be in the chamber. Normally only the person wearing the total-encapsulating suit will be inside the chamber. A stand-by person shall have a self-con-

tained breathing apparatus, or a positive pressure supplied air respirator available to enter the test area should the suited individual need assistance.

(iii) A method to monitor the suited individual must be used during this test. Visual contact is the simplest but other methods using communication devices are acceptable.

(iv) The test room must be large enough to allow the exercise protocol to be carried out and then to be ventilated to allow for easy exhaust of the ammonia test atmosphere after the test(s) are completed.

(v) Individuals must be medically screened for the use of respiratory protection and checked for allergies to ammonia before participating in this test procedure.

(f) Test procedure.

(i) Measure the test area to the nearest foot and calculate its volume in cubic feet. Multiply the test area volume by 0.2 milliliters of concentrated aqueous ammonia per cubic foot of test area volume to determine the approximate volume of concentrated aqueous ammonia required to generate 1000 ppm in the test area.

(A) Measure this volume from the supply of concentrated ammonia and place it into a closed plastic container.

(B) Place the container, several high range ammonia detector tubes and the pump in the clean test pan and locate it near the test area entry door so that the suited individual has easy access to these supplies.

(ii) In a noncontaminated atmosphere, open a presealed ammonia indicator strip and fasten one end of the strip to the inside of the suit face shield lens where it can be seen by the wearer. Moisten the indicator strip with distilled water. Care must be taken not to contaminate the detector part of the indicator paper by touching it. A small piece of masking tape or equivalent should be used to attach the indicator strip to the interior of the suit face shield.

(iii) If problems are encountered with this method of attachment the indicator strip can be attached to the outside of the respirator facepiece being used during the test.

(iv) Don the respiratory protective device normally used with the suit, and then don the TECP suit to be tested. Check to be sure all openings which are intended to be sealed (zippers, gloves, etc.) are completely sealed. DO NOT, however, plug off any venting valves.

(v) Step into the enclosed test room such as a closet, bathroom, or test booth, equipped with an exhaust fan. No air should be exhausted from the chamber during the test because this will dilute the ammonia challenge concentrations.

(vi) Open the container with the premeasured volume of concentrated aqueous ammonia within the enclosed test room, and pour the liquid into the empty plastic test pan. Wait two minutes to allow for adequate volatilization of the concentrated aqueous ammonia. A small mixing fan can be used near the evaporation pan to increase the evaporation rate of the ammonia solution.

(vii) After two minutes a determination of the ammonia concentration within the chamber should be made using the high range colorimetric detector tube. A concentration of 1000 ppm ammonia or greater must be generated before the exercises are started.

(viii) To test the integrity of the suit the following four minute exercise protocol should be followed:

(A) Raising the arms above the head with at least fifteen raising motions completed in one minute.

(B) Walking in place for one minute with at least fifteen raising motions of each leg in a one-minute period.

(C) Touching the toes with at least ten complete motions of the arms from above the head to touching of the toes in a one-minute period.

(D) Knee bends with at least ten complete standing and squatting motions in a one-minute period.

(ix) If at any time during the test the colorimetric indicating paper should change colors the test should be stopped and (f)(x) and (xi) of this subsection initiated.

(x) After completion of the test exercise, the test area concentration should be measured again using the high range colorimetric detector tube.

(xi) Exit the test area.

(xii) The opening created by the suit zipper or other appropriate suit penetration should be used to determine the ammonia concentration in the suit with the low range length of stain detector tube or other ammonia monitor. The internal TECP suit air should be sampled far enough from the enclosed test area to prevent a false ammonia reading.

(xiii) After completion of the measurement of the suit interior ammonia concentration the test is concluded and the suit is doffed and the respirator removed.

(xiv) The ventilating fan for the test room should be turned on and allowed to run for enough time to remove the ammonia gas. The fan must be vented to the outside of the building.

(xv) Any detectable ammonia in the suit interior (5 ppm ammonia (NH₃) or more for the length of stain detector tube) indicates the suit failed the test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass/fail criteria.

(xvi) By following this test method an intrusion coefficient of approximately two hundred or more can be measured with the suit in a completely operational condition. If the intrusion coefficient is two hundred or more, then the suit is suitable for emergency response and field use.

(g) Retest procedures.

(i) If the suit fails this test, check for leaks by following the pressure test in test (A) above.

(ii) Retest the TECP suit as outlined in the test procedure in (f) of this subsection.

(h) Report.

(i) Each gas tight totally encapsulating chemical protective suit tested by this practice shall have the following information recorded.

(A) Unique identification number, identifying brand name, date of purchase, material of construction, and unique suit features; e.g., special breathing apparatus.

(B) General description of test room used for test.

(C) Brand name and purchase date of ammonia detector strips and color change data.

(D) Brand name, sampling range, and expiration date of the length of stain ammonia detector tubes. The brand name and model of the sampling pump should also be recorded. If

another type of ammonia detector is used, it should be identified along with its minimum detection limit for ammonia.

(E) Actual test results must list the two test area concentrations, their average, the interior suit concentration, and the calculated intrusion coefficient. Retest data must be recorded as an additional test.

(ii) The evaluation of the data must be specified as "suit passed" or "suit failed" and the date of the test. Any detectable ammonia (5 ppm or greater for the length of stain detector tube) in the suit interior indicates the suit fails this test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass/fail criteria.

Caution: Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41081, filed 3/23/99, effective 6/23/99.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 296-62-41082 Appendix B—General description and discussion of the levels of protection and protective gear. (1) This appendix sets forth information about personal protective equipment (PPE) protection levels which may be used to assist employers in complying with the PPE requirements of this section.

(2) As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work on-site.

(3) Selection of the appropriate PPE is a complex process which must take into consideration a variety of factors. Key factors involved in this process are identification of the hazards or suspected hazards, their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact), and the performance of the PPE materials (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations.

(4) Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, must be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

(5) The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more infor-

mation about the hazards and conditions at the site becomes available, the site supervisor can make decisions to upgrade or downgrade the level of PPE protection to match the tasks at hand.

(6) The following are guidelines which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation and reselection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

(7) Personal protective equipment has been divided into four categories based on the degree of protection afforded (see subsection (8) of this section for further explanation of Levels A, B, C, and D hazards):

(a) Level A. To be selected when the greatest level of skin, respiratory, and eye protection is required. The following constitute Level A equipment; it may be used as appropriate:

(i) Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied-air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).

(ii) Totally encapsulating chemical-protective suit.

(iii) Coveralls.*

(iv) Long underwear.*

(v) Gloves, outer, chemical-resistant.

(vi) Gloves, inner, chemical-resistant.

(vii) Boots, chemical-resistant steel toe and shank.

(viii) Hard hat (under suit).*

(ix) Disposable protective suit, gloves, and boots. (Depending on suit construction, may be worn over totally encapsulating suit.)

*Optional, as applicable.

(b) Level B. The highest level of respiratory protection is necessary but a lesser level of skin protection is needed. The following constitute Level B equipment; it may be used as appropriate:

(i) Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied-air respirator with escape SCBA (NIOSH approved).

(ii) Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one or two-piece chemical-splash suit, disposable chemical-resistant overalls).

(iii) Coveralls.*

(iv) Gloves, outer, chemical-resistant.

(v) Gloves, inner, chemical-resistant.

(vi) Boots, outer, chemical-resistant steel toe and shank.

(vii) Boot-covers, outer, chemical-resistant (disposable).*

(viii) Hard hat.

(ix) Face shield.*

*Optional, as applicable.

(c) Level C. The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying

respirators are met. The following constitute Level C equipment; it may be used as appropriate.

(i) Full-face or half-mask, air purifying respirators (NIOSH approved).

(ii) Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).

(iii) Coveralls.*

(iv) Gloves, outer, chemical-resistant.

(v) Gloves, inner, chemical-resistant.

(vi) Boots (outer), chemical-resistant steel toe and shank.*

(vii) Boot-covers, outer, chemical-resistant (disposable).*

(viii) Hard hat.

(ix) Escape mask.*

(x) Face shield.*

*Optional, as applicable.

(d) Level D. A work uniform affording minimal protection: Used for nuisance contamination only. The following constitute Level D equipment; it may be used as appropriate.

(i) Coveralls.

(ii) Gloves.*

(iii) Boots/shoes, chemical-resistant steel toe and shank.

(iv) Boots, outer, chemical-resistant (disposable).*

(v) Safety glasses or chemical splash goggles.*

(vi) Hard hat.

(vii) Escape mask.*

(viii) Face shield.*

*Optional, as applicable.

(8) Part B. The types of hazards for which Levels A, B, C, and D protection are appropriate are described below:

(a) Level A - Level A protection should be used when:

(i) The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin;

(ii) Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or

(iii) Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

(b) Level B protection should be used when:

(i) The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;

(ii) The atmosphere contains less than 19.5 percent oxygen; or

(iii) The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

(c) Level C protection should be used when:

(i) The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;

(ii) The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and

(iii) All criteria for the use of air-purifying respirators are met.

(d) Level D protection should be used when:

(i) The atmosphere contains no known hazard; and

(ii) Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note: As stated before combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

(9) As an aid in selecting suitable chemical protective clothing, it should be noted that the National Fire Protection Association (NFPA) has developed standards on chemical protective clothing. The standards that have been adopted include:

(a) NFPA 1991 - Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing);

(b) NFPA 1992 - Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing);

(c) NFPA 1993 - Standard on Liquid Splash-Protective Suits for Nonemergency, Nonflammable Hazardous Chemical Situations (EPA Level B Protective Clothing).

(10) These standards apply documentation and performance requirements to the manufacture of chemical protective suits. Chemical protective suits meeting these requirements are labelled as compliant with the appropriate standard. It is recommended that chemical protective suits that meet these standards be used.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41082, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41084 Appendix C—Compliance

guidelines. (1) For hazardous materials specialists (usually members of hazardous materials teams), the training will need to address the care, use and/or testing of chemical protective clothing including totally encapsulating suits, the medical surveillance program, the standard operating procedures for the hazardous materials team including the use of plugging and patching equipment and other subject areas.

(2) Officers and leaders who may be expected to be in charge at an incident will need to be fully knowledgeable of their company's incident command system. They will need to know where and how to obtain additional assistance and be familiar with the local district's emergency response plan and the state emergency response plan.

(3) Specialist employees such as technical experts, medical experts, or environmental experts that work with hazardous materials in their regular jobs, who may be sent to the incident scene by the shipper, manufacturer or governmental agency to advise and assist the person in charge of the incident will have training on an annual basis. Their training must include the care and use of personal protective equipment including respirators; knowledge of the incident command system and how they are to relate to it; and those areas needed to keep them current in their respective field as it relates to safety and health involving specific hazardous substances.

(4) Those skilled support personnel, such as employees who work for public works departments or equipment operators who operate bulldozers, sand trucks, backhoes, etc., who may be called to the incident scene to provide emergency support assistance, will need to have at least a safety and health briefing before entering the area of potential or actual exposure. These specially skilled support personnel, who have not been a part of the emergency plan and do not meet the training requirements, must be made aware of the hazards they face and be provided all necessary protective clothing and equipment required for their tasks.

(5) There are two National Fire Protection Association standards, NFPA 472—"Standard for Professional Competence of Responders to Hazardous Material Incidents" and NFPA 471—"Recommended Practice for Responding to Hazardous Material Incidents," which are excellent resource documents to aid fire departments and other emergency response organizations in developing their training program materials. NFPA 472 provides guidance on the skills and knowledge needed for first responder awareness level, first responder operations level, HAZMAT technicians, and HAZMAT specialist. It also offers guidance for the officer corp who will be in charge of hazardous substance incidents.

(6) Decontamination. Decontamination procedures will be tailored to the specific hazards of the site and will vary in complexity, and number of steps, depending on the level of hazard and the employee's exposure to the hazard. Decontamination procedures and PPE decontamination methods will vary depending upon the specific substance, since one procedure or method will not work for all substances. Evaluation of decontamination methods and procedures should be performed, as necessary, to assure that employees are not exposed to hazards by reusing PPE. References in WAC 296-62-41085, Appendix D, may be used for guidance in establishing an effective decontamination program. In addition, the United States Coast Guard Manual, "Policy Guidance for Response to Hazardous Chemical Releases," United States Department of Transportation, Washington, D.C. (COMDTINST M16465.30), is a good reference for establishing an effective decontamination program.

(7) Emergency response plans. States, along with designated districts within the states, will be developing or have developed emergency response plans. These state and district plans are to be used in the emergency response plans called for in this standard. Each employer needs to assure that its emergency response plan is compatible with the local plan. The major reference being used to aid in developing the state and local district plans is the Hazardous Materials

Emergency Planning Guide, NRT-1. The current Emergency Response Guidebook from the United States Department of Transportation, CMA's CHEMTREC and the Fire Service Emergency Management Handbook may also be used as resources.

(8) Personal protective equipment programs. The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biologic hazards that may be encountered at a hazardous substance site.

(a) As discussed in Appendix B, no single combination of protective equipment and clothing is capable of protecting against all hazards. Thus PPE should be used in conjunction with other protective methods and its effectiveness evaluated periodically.

(b) The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication. For any given situation, equipment and clothing will be selected that provide an adequate level of protection. However, over protection, as well as under protection, can be hazardous and should be avoided where possible.

(c) Two basic objectives of any PPE program will be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To accomplish these goals, a comprehensive PPE program will include hazard identification, medical monitoring, environmental surveillance, selection, use, maintenance, and decontamination of PPE and its associated training.

(d) The written PPE program will include policy statements, procedures, and guidelines. Copies will be made available to all employees and a reference copy will be made available at the worksite. Technical data on equipment, maintenance manuals, relevant regulations, and other essential information will also be collected and maintained.

(9) Incident command system (ICS). WAC 296-62-40115(2) requires the implementation of an ICS. The ICS is an organized approach to effectively control and manage operations at an emergency incident. The individual in charge of the ICS is the senior official responding to the incident. The ICS is not much different than the "command post" approach used for many years by the fire service. During large complex fires involving several companies and many pieces of apparatus, a command post would be established. This enables one individual to be in charge of managing the incident, rather than having several officers from different companies making separate, and sometimes conflicting, decisions. The individual in charge of the command post would delegate responsibility for performing various tasks to subordinate officers. Additionally, all communications were routed through the command post to reduce the number of radio transmissions and eliminate confusion. However, strategy, tactics, and all decisions were made by one individual.

(a) The ICS is a very similar system, except it is implemented for emergency response to all incidents, both large and small, that involve hazardous substances.

(b) For a small incident, the individual in charge of the ICS may perform many tasks of the ICS. There may not be any, or little, delegation of tasks to subordinates. For exam-

ple, in response to a small incident, the individual in charge of the ICS, in addition to normal command activities, may become the safety officer and may designate only one employee (with proper equipment) as a back-up to provide assistance if needed. WISHA does recommend, however, that at least two employees be designated as back-up personnel since the assistance needed may include rescue.

(c) To illustrate the operation of the ICS, the following scenario might develop during a small incident, such as an overturned tank truck with a small leak of flammable liquid.

(d) The first responding senior officer would implement and take command of the ICS. That person would size-up the incident and determine if additional personnel and apparatus were necessary; would determine what actions to take to control the leak; and, determine the proper level of personal protective equipment. If additional assistance is not needed, the individual in charge of the ICS would implement actions to stop and control the leak using the fewest number of personnel that can effectively accomplish the tasks. The individual in charge of the ICS then would designate him or herself as the safety officer and two other employees as a back-up in case rescue may become necessary. In this scenario, decontamination procedures would not be necessary.

(e) A large complex incident may require many employees and difficult, time-consuming efforts to control. In these situations, the individual in charge of the ICS will want to delegate different tasks to subordinates in order to maintain a span of control that will keep the number of subordinates, that are reporting, to a manageable level.

(f) Delegation of tasks at large incidents may be by location, where the incident scene is divided into sectors, and subordinate officers coordinate activities within the sector that they have been assigned.

(g) Delegation of tasks can also be by function. Some of the functions that the individual in charge of the ICS may want to delegate at a large incident are: Medical services; evacuation; water supply; resources (equipment, apparatus); media relations; safety; and, site control (integrate activities with police for crowd and traffic control). Also for a large incident, the individual in charge of the ICS will designate several employees as back-up personnel; and a number of safety officers to monitor conditions and recommend safety precautions.

(h) Therefore, no matter what size or complexity an incident may be, by implementing an ICS there will be one individual in charge who makes the decisions and gives directions; and, all actions and communications are coordinated through one central point of command. Such a system should reduce confusion, improve safety, organize and coordinate actions, and should facilitate effective management of the incident.

(10) Site safety and control plans.

(a) The safety and security of response personnel and others in the area of an emergency response incident site should be of primary concern to the incident commander. The use of a site safety and control plan could greatly assist those in charge of assuring the safety and health of employees on the site.

(b) A comprehensive site safety and control plan should include the following: Summary analysis of hazards on the

site and a risk analysis of those hazards; site map or sketch; site work zones (clean zone, transition or decontamination zone, work or hot zone); use of the buddy system; site communications; command post or command center; standard operating procedures and safe work practices; medical assistance and triage area; hazard monitoring plan (air contaminant monitoring, etc.); decontamination procedures and area; and other relevant areas. This plan should be a part of the employer's emergency response plan or an extension of it to the specific site.

(11) Medical surveillance programs.

(a) Workers handling hazardous substances may be exposed to toxic chemicals, safety hazards, biologic hazards, and radiation. Therefore, a medical surveillance program is essential to assess and monitor workers' health and fitness for employment in hazardous waste operations and during the course of work; to provide emergency and other treatment as needed; and to keep accurate records for future reference.

(b) The Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), the United States Coast Guard (USCG), and the Environmental Protection Agency (EPA); October 1985 provides an excellent example of the types of medical testing that should be done as part of a medical surveillance program.

(12) New technology and spill containment programs.

Where hazardous substances may be released by spilling from a container that will expose employees to the hazards of the materials, the employer will need to implement a program to contain and control the spilled material. Diking and ditching, as well as use of absorbents like diatomaceous earth, are traditional techniques which have proven to be effective over the years. However, in recent years new products have come into the marketplace, the use of which complement and increase the effectiveness of these traditional methods. These new products also provide emergency responders and others with additional tools or agents to use to reduce the hazards of spilled materials.

These agents can be rapidly applied over a large area and can be uniformly applied or otherwise can be used to build a small dam, thus improving the workers' ability to control spilled material. These application techniques enhance the intimate contact between the agent and the spilled material allowing for the quickest effect by the agent or quickest control of the spilled material. Agents are available to solidify liquid spilled materials, to suppress vapor generation from spilled materials, and to do both. Some special agents, which when applied as recommended by the manufacturer, will react in a controlled manner with the spilled material to neutralize acids or caustics, or greatly reduce the level of hazard of the spilled material.

There are several modern methods and devices for use by emergency response personnel or others involved with spill control efforts to safely apply spill control agents to control spilled material hazards. These include portable pressurized applicators similar to hand-held portable fire extinguishing devices, and nozzle and hose systems similar to portable fire fighting foam systems which allow the operator to apply

the agent without having to come into contact with the spilled material. The operator is able to apply the agent to the spilled material from a remote position.

The solidification of liquids provides for rapid containment and isolation of hazardous substance spills. By directing the agent at run-off points or at the edges of the spill, the reactant solid will automatically create a barrier to slow or stop the spread of the material. Clean-up of hazardous substances is greatly improved when solidifying agents, acid or caustic neutralizers, or activated carbon absorbents are used. Properly applied, these agents can totally solidify liquid hazardous substances or neutralize or absorb them, which results in materials which are less hazardous and easier to handle, transport, and dispose of. The concept of spill treatment, to create less hazardous substances, will improve the safety and level of protection of employees working at spill clean-up operations or emergency response operations to spills of hazardous substances.

The use of vapor suppression agents for volatile hazardous substances, such as flammable liquids and those substances which present an inhalation hazard, is important for protecting workers. The rapid and uniform distribution of the agent over the surface of the spilled material can provide quick vapor knockdown. There are temporary and long-term foam-type agents which are effective on vapors and dusts, and activated carbon adsorption agents which are effective for vapor control and soaking-up of the liquid. The proper use of hose lines or hand-held portable pressurized applicators provides good mobility and permits the worker to deliver the agent from a safe distance without having to step into the untreated spilled material. Some of these systems can be recharged in the field to provide coverage of larger spill areas than the design limits of a single charged applicator unit. Some of the more effective agents can solidify the liquid flammable hazardous substances and at the same time elevate the flashpoint above 140°F so the resulting substance may be handled as a nonhazardous waste material if it meets the United States Environmental Protection Agency's 40 CFR Part 261 requirements (see particularly Sec. 261.21).

All workers performing hazardous substance spill control work are expected to wear the proper protective clothing and equipment for the materials present and to follow the employer's established standard operating procedures for spill control. All involved workers need to be trained in the established operating procedures; in the use and care of spill control equipment; and in the associated hazards and control of such hazards of spill containment work.

These new tools and agents are the things that employers will want to evaluate as part of their new technology program. The treatment of spills of hazardous substances or wastes at an emergency incident as part of the immediate spill containment and control efforts is sometimes acceptable to EPA and a permit exception is described in 40 CFR 264.1 (g)(8) and 265.1 (c)(11).

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41084, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41085 Appendix D—References. The following references may be consulted for further information on the subject of this notice:

(1) OSHA Instruction DFO CPL 2.70 - January 29, 1986, Special Emphasis Program: Hazardous Waste Sites.

(2) OSHA Instruction DFO CPL 2-2.37A - January 29, 1986, Technical Assistance and Guidelines for Superfund and Other Hazardous Waste Site Activities.

(3) OSHA Instruction DTS CPL 2.74 - January 29, 1986, Hazardous Waste Activity Form, OSHA 175.

(4) Hazardous Waste Inspections Reference Manual, U.S. Department of Labor, Occupational Safety and Health Administration, 1986.

(5) Memorandum of Understanding Among the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the United States Coast Guard, and the United States Environmental Protection Agency; Guidance for Worker Protection During Hazardous Waste Site Investigations and Clean-up and Hazardous Substance Emergencies; December 18, 1980.

(6) National Priorities List, 1st Edition, October 1984; U.S. Environmental Protection Agency, Revised periodically.

(7) The Decontamination of Response Personnel, Field Standard Operating Procedures (F.S.O.P.) 7; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, December 1984.

(8) Preparation of a Site Safety Plan, Field Standard Operating Procedures (F.S.O.P.) 9; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, April 1985.

(9) Standard Operating Safety Guidelines; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, Environmental Response Team; November 1984.

(10) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), and Environmental Protection Agency (EPA); October 1985.

(11) Protecting Health and Safety at Hazardous Waste Sites: An Overview, U.S. Environmental Protection Agency, EPA/625/9-85/006; September 1985.

(12) Hazardous Waste Sites and Hazardous Substance Emergencies, NIOSH Worker Bulletin, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; December 1982.

(13) Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; October 1984.

(14) Fire Service Emergency Management Handbook, International Association of Fire Chiefs Foundation, 101 East Holly Avenue, Unit 10B, Sterling, VA 22170, January 1985.

(15) Emergency Response Guidebook, U.S. Department of Transportation, Washington, D.C., 1987.

(16) Report to the Congress on Hazardous Materials Training, Planning and Preparedness, Federal Emergency Management Agency, Washington, D.C., July 1986.

(17) Workbook for Fire Command, Alan V. Brunacini and J. David Beageron, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269, 1985.

(18) Fire Command, Alan V. Brunacini, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269, 1985.

(19) Incident Command System, Fire Protection Publications, Oklahoma State University, Stillwater, OK 74078, 1983.

(20) Site Emergency Response Planning, Chemical Manufacturers Association, Washington, D.C. 20037, 1986.

(21) Hazardous Materials Emergency Planning Guide, NRT-1, Environmental Protection Agency, Washington, D.C., March 1987.

(22) Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety. U.S. Department of Transportation, Washington, D.C., May 1983.

(23) Disaster Planning Guide for Business and Industry, Federal Emergency Management Agency, Publication No. FEMA 141, August 1987.

[Statutory Authority: RCW 49.17.040. 99-07-097, § 296-62-41085, filed 3/23/99, effective 6/23/99.]

WAC 296-62-41086 Appendix E—Training curriculum guidelines. The following nonmandatory general criteria may be used for assistance in developing training curriculum used to meet the training requirements of Part R.

These are generic guidelines and they are not presented as a complete training curriculum for any specific employer. Site-specific training programs must be developed on the basis of a needs assessment of the emergency response operation in accordance with this chapter (chapter 296-62 WAC, Part R).

The guidance set forth here presents a highly effective program that in the areas covered would meet or exceed the regulatory requirements. In addition, other approaches could meet the regulatory requirements.

Suggested general criteria:

Definitions:

Suggested core criteria:

"Competent" means possessing the skills, knowledge, experience, and judgment to perform assigned tasks or activities satisfactorily as determined by the employer.

"Demonstration" means the showing by actual use of equipment or procedures.

"Hands-on training" means training in a simulated work environment that permits each student to have experience performing tasks, making decisions, or using equipment appropriate to the job assignment for which the training is being conducted.

"Initial training" means training required before beginning work.

"Lecture" means an interactive discourse with a class lead by an instructor.

"Proficient" means meeting a stated level of achievement.

"Site-specific" means individual training directed to the operations of a specific job site.

"Training hours" means the number of hours devoted to lecture, learning activities, small group work sessions, demonstration, evaluations, or hands-on experience.

(1) Training facility. The training facility should have available sufficient resources, equipment, and site locations to perform concise and hands-on training when appropriate. Training facilities should have sufficient organization, support staff, and services to conduct training in each of the courses offered.

(2) Training director. Each training program should be under the direction of a training director who is responsible for the program. The training director should have a minimum of two years of employee education experience.

(3) Instructors. Instructors should be deemed competent on the basis of previous documented experience in their area of instruction, successful completion of a "train-the-trainer" program specific to the topics they will teach, and an evaluation of instructional competence by the training director.

(a) Instructors should be required to maintain professional competency by participating in continuing education or professional development programs or by successfully completing an annual refresher course and having an annual review by the training director.

(b) The annual review by the training director should include observation of an instructor's delivery, a review of those observations with the trainer, and an analysis of any instructor or class evaluations completed by the students during the previous year.

(4) Course materials. The training director should approve all course materials to be used by the training provider. Course materials should be reviewed and updated at least annually. Materials and equipment should be in good working order and maintained properly.

(a) All written and audio-visual materials in training curricula should be peer reviewed by technically competent outside reviewers or by a standing advisory committee.

(b) Reviewers should possess expertise in the following disciplines were applicable: Occupational health, industrial hygiene and safety, chemical/environmental engineering, employee education, or emergency response. One or more of the peer reviewers should be an employee experienced in the work activities to which the training is directed.

(5) Students. The program for accepting students should include:

(a) Assurance that the student is or will be involved in work where chemical exposures are likely and that the student possesses the skills necessary to perform the work.

(b) A policy on the necessary medical clearance.

(6) Ratios. Student-instructor ratios should not exceed thirty students per instructor. Hands-on activity requiring the use of personal protective equipment should have the following student-instructor ratios: For Level C or Level D personal protective equipment the ratio should be ten students per instructor. For Level A or Level B personal protective equipment the ratio should be five students per instructor.

(7) Proficiency assessment. Proficiency should be evaluated and documented by the use of a written assessment and a skill demonstration selected and developed by the training

director and training staff. The assessment and demonstration should evaluate the knowledge and individual skills developed in the course of training. The level of minimum achievement necessary for proficiency shall be specified in writing by the training director.

(a) If a written test is used, there should be a minimum of fifty questions. If a written test is used in combination with a skills demonstration, a minimum of twenty-five questions should be used. If a skills demonstration is used, the tasks chosen and the means to rate successful completion should be fully documented by the training director.

(b) The content of the written test or of the skill demonstration shall be relevant to the objectives of the course.

The written test and skill demonstration should be updated as necessary to reflect changes in the curriculum and any update should be approved by the training director.

(c) The proficiency assessment methods, regardless of the approach or combination of approaches used, should be justified, documented and approved by the training director.

(d) The proficiency of those taking the additional courses for supervisors should be evaluated and documented by using proficiency assessment methods acceptable to the training director. These proficiency assessment methods must reflect the additional responsibilities borne by supervisory personnel in hazardous waste operations or emergency response.

(8) Course certificate. Written documentation should be provided to each student who satisfactorily completes the training course. The documentation should include:

(a) Student's name.

(b) Course title.

(c) Course date.

(d) Statement that the student has successfully completed the course.

(e) Name and address of the training provider.

(f) An individual identification number for the certificate.

(g) List of the levels of personal protective equipment used by the student to complete the course.

(i) This documentation may include a certificate and an appropriate wallet-sized laminated card with a photograph of the student and the above information.

(ii) When such course certificate cards are used, the individual identification number for the training certificate should be shown on the card.

(9) Recordkeeping. Training providers should maintain records listing the dates courses were presented, the names of the individual course attendees, the names of those students successfully completing each course, and the number of training certificates issued to each successful student. These records should be maintained for a minimum of five years after the date an individual participated in a training program offered by the training provider. These records should be available and provided upon the student's request or as mandated by law.

(10) Program quality control. The training director should conduct or direct an annual written audit of the training program. Program modifications to address deficiencies, if any, should be documented, approved, and implemented by the training provider. The audit and the program modification documents should be maintained at the training facility.

Suggested Program Quality Control Criteria:

Factors listed here are suggested criteria for determining the quality and appropriateness of employee health and safety training for hazardous waste operations and emergency response.

(a) Training plan. Adequacy and appropriateness of the training program's curriculum development, instructor training, distribution of course materials, and direct student training should be considered, including:

(i) The duration of training, course content, and course schedules/agendas;

(ii) The different training requirements of the various target populations, as specified in the appropriate generic training curriculum;

(iii) The process for the development of curriculum, which includes appropriate technical input, outside review, evaluation, program pretesting.

(iv) The adequate and appropriate inclusion of hands-on, demonstration, and instruction methods;

(v) Adequate monitoring of student safety, progress, and performance during the training.

(b) Program management, training director, staff, and consultants. Adequacy and appropriateness of staff performance and delivering an effective training program should be considered, including:

(i) Demonstration of the training director's leadership in assuring quality of health and safety training;

(ii) Demonstration of the competency of the staff to meet the demands of delivering high quality hazardous waste employee health and safety training;

(iii) Organization charts establishing clear lines of authority;

(iv) Clearly defined staff duties including the relationship of the training staff to the overall program;

(v) Evidence that the training organizational structure suits the needs of the training program;

(vi) Appropriateness and adequacy of the training methods used by the instructors;

(vii) Sufficiency of the time committed by the training director and staff to the training program;

(viii) Adequacy of the ratio of training staff to students;

(ix) Availability and commitment of the training program of adequate human and equipment resources in the areas of:

(A) Health effects;

(B) Safety;

(C) Personal protective equipment (PPE);

(D) Operational procedures;

(E) Employee protection practices/procedures;

(x) Appropriateness of management controls;

(xi) Adequacy of the organization and appropriate resources assigned to assure appropriate training;

(xii) In the case of multiple-site training programs, adequacy of management of the satellite centers.

(c) Training facilities and resources. Adequacy and appropriateness of the facilities and resources for supporting the training program should be considered, including:

(i) Space and equipment to conduct the training;

(ii) Facilities for representative hands-on training;

(iii) In the case of multiple-site programs, equipment and facilities at the satellite centers;

(iv) Adequacy and appropriateness of the quality control and evaluations program to account for instructor performance;

(v) Adequacy and appropriateness of the quality control and evaluation program to ensure appropriate course evaluation, feedback, updating, and corrective action;

(vi) Adequacy and appropriateness of disciplines and expertise being used within the quality control and evaluation program;

(vii) Adequacy and appropriateness of the role of student evaluations to provide feedback for training program improvement.

(d) Quality control and evaluation. Adequacy and appropriateness of quality control and evaluation plans for training programs should be considered, including:

(i) A balanced advisory committee and/or competent outside reviewers to give overall policy guidance;

(ii) Clear and adequate definition of the composition and active programmatic role of the advisory committee or outside reviewers;

(iii) Adequacy of the minutes or reports of the advisory committee or outside reviewers' meetings or written communication;

(iv) Adequacy and appropriateness of the quality control and evaluations program to account for instructor performance;

(v) Adequacy and appropriateness of the quality control and evaluation program to ensure appropriate course evaluation, feedback, updating, and corrective action;

(vi) Adequacy and appropriateness of disciplines and expertise being used within the quality control and evaluation program;

(vii) Adequacy and appropriateness of the role of student evaluations to provide feedback for training program improvement.

(e) Students. Adequacy and appropriateness of the program for accepting students should be considered, including:

(i) Assurance that the student already possess the necessary skills for their job, including necessary documentation;

(ii) Appropriateness of methods the program uses to ensure that recruits are capable of satisfactorily completing training;

(iii) Review and compliance with any medical clearance policy.

(f) Institutional environment and administrative support. The adequacy and appropriateness of the institutional environment and administrative support system for the training program should be considered, including:

(i) Adequacy of the institutional commitment to the employee training program;

(ii) Adequacy and appropriateness of the administrative structure and administrative support.

(g) Summary of evaluation questions. Key questions for evaluating the quality and appropriateness of an overall training program should include the following:

(i) Are the program objectives clearly stated?

(ii) Is the program accomplishing its objectives?

(iii) Are appropriate facilities and staff available?

(iv) Is there an appropriate mix of classroom, demonstration, and hands-on training?

(v) Is the program providing quality employee health and safety training that fully meets the intent of regulatory requirements?

(vi) What are the program's main strengths?

(vii) What are the program's main weaknesses?

(viii) What is recommended to improve the program?

(ix) Are instructors instructing according to their training outlines?

(x) Is the evaluation tool current and appropriate for the program content?

(xi) Is the course material current and relevant to the target group?

Suggested Training Curriculum Guidelines:

The following training curriculum guidelines are for those operations specifically identified in this Part R as requiring training. Issues such as qualifications of instructors, training certification, and similar criteria appropriate to all categories of operations addressed in this Part R have been covered in the preceding section and are not addressed in each of the generic guidelines.

(h) Emergency response training.

(i) General considerations. Emergency response organizations are required to consider the topics listed in WAC 296-62-41020. Emergency response organizations may use some or all of the following topics to supplement those mandatory topics when developing their response training programs. Many of the topics would require an interaction between the response provider and the individuals responsible for the site where the response would be expected.

(A) Hazard recognition, including:

(I) Nature of hazardous substances present;

(II) Practical applications of hazard recognition, including presentations on biology, chemistry, and physics.

(B) Principles of toxicology, biological monitoring, and risk assessment.

(C) Safe work practices and general site safety.

(D) Engineering controls and hazardous waste operations.

(E) Site safety plans and standard operating procedures.

(F) Decontamination procedures and practices.

(G) Emergency procedures, first aid, and self-rescue.

(H) Safe use of field equipment.

(I) Storage, handling, use and transportation of hazardous substances.

(J) Use, care, and limitations of personal protective equipment.

(K) Safe sampling techniques.

(L) Rights and responsibilities of employees under WISHA and other related regulations and laws concerning right-to-know, safety and health, compensations and liability.

(M) Medical monitoring requirements.

(N) Community relations.

(ii) Suggested criteria for specific courses.

(A) First responder awareness level.

(I) Review of and demonstration of competency in performing the applicable skills of WAC 296-62-41010.

(II) Hands-on experience with the U.S. Department of Transportation's Emergency Response Guidebook (ERG)

and familiarization with chapter 296-62 WAC, Part C, the hazard communication standard.

(III) Review of the principles and practices for analyzing an incident to determine both the hazardous substances present and the basic hazard and response information for each hazardous substance present.

(IV) Review of procedures for implementing actions consistent with the local emergency response plan, the organization's standard operating procedures, and the current edition of DOT's ERG including emergency notification procedures and follow-up communications.

(V) Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.

(VI) Awareness and knowledge of the competencies for the First Responder at the Awareness Level covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials Incidents.

(B) First responder operations level.

(I) Review of and demonstration of competency in performing the applicable skills of WAC 296-62-41010.

(II) Hands-on experience with the U.S. Department of Transportation's Emergency Response Guidebook (ERG), manufacturer material safety data sheets, CHEMTREC/CANUTEC, shipper or manufacturer contacts, and other relevant sources of information addressing hazardous substance releases. Familiarization with chapter 296-62 WAC, Part C, the hazard communication standard.

(III) Review of the principles and practices for analyzing an incident to determine the hazardous substances present, the likely behavior of the hazardous substance and its container, the types of hazardous substance transportation containers and vehicles, the types and selection of the appropriate defensive strategy for containing the release.

(IV) Review of procedures for implementing continuing response actions consistent with the local emergency response plan, the organization's standard operating procedures, and the current edition of DOT's ERG including extended emergency notification procedures and follow-up communications.

(V) Review of the principles and practice for proper selection and use of personal protective equipment.

(VI) Review of the principles and practice of personnel and equipment decontamination.

(VII) Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.

(VIII) Awareness and knowledge of the competencies for the First Responder at the Operations Level covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials Incidents.

(C) Hazardous materials technician.

(I) Review of and demonstration of competency in performing the applicable skills of WAC 296-62-41010.

(II) Hands-on experience with written and electronic information relative to response decision making including,

but not limited to, the U.S. Department of Transportation's Emergency Response Guidebook (ERG), manufacturer material safety data sheets, CHEMTREC/CANUTEC, shipper or manufacturer contacts, computer data bases and response models, and other relevant sources of information addressing hazardous substance releases. Familiarization with chapter 296-62 WAC, Part C, the hazard communication standard.

(III) Review of the principles and practices for analyzing an incident to determine the hazardous substances present, their physical and chemical properties, the likely behavior of the hazardous substance and its container, the types of hazardous substance transportation containers and vehicles involved in the release, the appropriate strategy for approaching release sites and containing the release.

(IV) Review of procedures for implementing continuing response actions consistent with the local emergency response plan, the organization's standard operating procedures, and the current edition of DOT's ERG including extended emergency notification procedures and follow-up communications.

(V) Review of the principles and practice for proper selection and use of personal protective equipment.

(VI) Review of the principles and practices of establishing exposure zones, proper decontamination and medical surveillance stations and procedures.

(VII) Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.

(VIII) Awareness and knowledge of the competencies for the Hazardous Materials Technician covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials Incidents.

(D) Hazardous materials specialist.

(I) Review of and demonstration of competency in performing the applicable skills of WAC 296-62-41010.

(II) Hands-on experience with retrieval and use of written and electronic information relative to response decision making including, but not limited to, the U.S. Department of Transportation's Emergency Response Guidebook (ERG), manufacturer material safety data sheets, CHEMTREC/CANUTEC, shipper or manufacturer contacts, computer data bases and response models, and other relevant sources of information addressing hazardous substance releases. Familiarization with chapter 296-62 WAC, Part C, the hazard communication standard.

(III) Review of the principles and practices for analyzing an incident to determine the hazardous substances present, their physical and chemical properties, and the likely behavior of the hazardous substance and its container, vessel, or vehicle.

(IV) Review of the principles and practices for identification of the types of hazardous substance transportation containers, vessels and vehicles involved in the release; selecting and using the various types of equipment available for plugging or patching transportation containers, vessels or vehicles; organizing and directing the use of multiple teams of hazardous material technicians and selecting the appropriate

strategy for approaching release sites and containing or stopping the release.

(V) Review of procedures for implementing continuing response actions consistent with the local emergency response plan, the organization's standard operating procedures, including knowledge of the available public and private response resources, establishment of an incident command post, direction of hazardous material technician teams, and extended emergency notification procedures and follow-up communications.

(VI) Review of the principles and practice for proper selection and use of personal protective equipment.

(VII) Review of the principles and practices of establishing exposure zones and proper decontamination, monitoring and medical surveillance stations and procedures.

(VIII) Review of the expected hazards including fire and explosions hazards, confined space hazards, electrical hazards, powered equipment hazards, motor vehicle hazards, and walking-working surface hazards.

(IX) Awareness and knowledge of the competencies for the Off-site Specialist Employee covered in the National Fire Protection Association's Standard No. 472, Professional Competence of Responders to Hazardous Materials Incidents.

(E) Incident commander.

The incident commander is the individual who, at any one time, is responsible for and in control of the response effort. This individual is the person responsible for the direction and coordination of the response effort. An incident commander's position should be occupied by the most senior, appropriately trained individual present at the response site. Yet, as necessary and appropriate by the level of response provided, the position may be occupied by many individuals during a particular response as the need for greater authority, responsibility, or training increases. It is possible for the first responder at the awareness level to assume the duties of incident commander until a more senior and appropriately trained individual arrives at the response site.

Therefore, any emergency responder expected to perform as an incident commander should be trained to fulfill the obligations of the position at the level of response they will be providing including the following:

(I) Ability to analyze a hazardous substance incident to determine the magnitude of the response problem.

(II) Ability to plan and implement an appropriate response plan within the capabilities of available personnel and equipment.

(III) Ability to implement a response to favorably change the outcome of the incident in a manner consistent with the local emergency response plan and the organization's standard operating procedures.

(IV) Ability to evaluate the progress of the emergency response to ensure that the response objectives are being met safely, effectively, and efficiently.

(V) Ability to adjust the response plan to the conditions of the response and to notify higher levels of response when required by the changes to the response plan.

[Statutory Authority: RCW 49.17.040, 99-07-097, § 296-62-41086, filed 3/23/99, effective 6/23/99.]

Chapter 296-63 WAC
RIGHT TO KNOW FEE ASSESSMENT

WAC

296-63-001	Purpose and scope.
296-63-003	Definitions.
296-63-005	Selected industries.
296-63-007	Fee assessment.
296-63-009	Exemption requests.
296-63-011	Fraudulent exemption requests.
296-63-013	Appeals.
296-63-015	Fee assessment not received.

WAC 296-63-001 Purpose and scope. This chapter establishes a fee assessment under the Worker and Community Right to Know Act in accordance with RCW 49.70.170.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-001, filed 11/6/86.]

WAC 296-63-003 Definitions. Unless the context clearly requires otherwise, the definitions of this section shall apply throughout this chapter.

(1) "Department" means the department of labor and industries.

(2) "Director" means the director of the department of labor and industries or his/her designee.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-003, filed 11/6/86.]

WAC 296-63-005 Selected industries. Fees shall only be assessed to employers engaged in business operations having a standard industrial classification, as designated in the standard industrial classification manual prepared by the federal Office of Management and Budget, within the following major groups:

(1) Numbers 01 through 08 (agriculture and forestry industries).

(2) Numbers 10 through 14 (mining industries).

(3) Numbers 15 through 17 (construction industries).

(4) Numbers 20 through 39 (manufacturing industries).

(5) Numbers 41, 42, and 44 through 49 (transportation, communications, electric, gas, and sanitary services).

(6) Number 75 (automotive repair services, and garages).

(7) Number 76 (miscellaneous repair services).

(8) Number 80 (health services).

(9) Number 82 (educational services).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-005, filed 11/6/86.]

WAC 296-63-007 Fee assessment. (1) The department shall assess an annual fee to each employer in the selected industries identified in WAC 296-63-003.

(2) The fee shall only be assessed to employers who reported ten thousand four hundred or more worker hours to the department.

(3) The fee assessment shall be based on reported worker hours for the prior calendar year.

(4) One full-time equivalent employee is equal to two thousand eighty worker hours.

(5) The fee assessment shall be two dollars and fifty cents for each full-time equivalent employee. Any fraction of

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a full-time equivalent employee shall be counted as one full-time equivalent employee.

(6) The annual fee shall not exceed fifty thousand dollars for an individual employer.

(7) All fees collected by the department shall be deposited in the worker and community right to know fund.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-007, filed 11/6/86.]

WAC 296-63-009 Exemption requests. (1) Employers who do not have hazardous chemicals at their workplace may submit a written request for exemption to the department. Submission of an exemption request does not relieve an employer of his/her obligation to pay the fee assessment until such time as the request is approved. Employers granted exemptions will be removed from the listing of employers to be assessed a fee beginning with the current billing period.

(2) Exemptions shall only be considered for an employer's entire workplace consisting of all activities reported to the department under the same employer identification number.

(3) Each request for exemption must contain the following information:

(a) Firm name and employer identification number;

(b) Complete mailing address;

(c) Complete location (such as street) address;

(d) A certified statement in the form required by RCW 9A.72.085 that a hazardous chemical survey of the employer's premises has been completed by a qualified person, the identity and qualifications of the person completing the survey, and that no hazardous chemicals as defined by WAC 296-62-054 through 296-62-05427 are present at the workplace.

(4) The department may schedule an on-site inspection to determine the validity of the exemption request.

(5) The employer shall provide to the department within five working days of receiving a request from the department, any additional information identified by the department as necessary for evaluating the exemption request.

(6) Exemption requests shall be mailed to:

Right to Know Program

Department of Labor and Industries

P.O. Box 44620

Olympia, Washington 98504-4620

[Statutory Authority: RCW 49.70.170 and 49.17.040. 98-02-029, § 296-63-009, filed 12/31/97, effective 1/31/98. Statutory Authority: RCW 49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-009, filed 11/6/86.]

WAC 296-63-011 Fraudulent exemption requests.

(1) The department may assess a civil penalty against any employer who submits a fraudulent exemption request. Such penalty assessment shall be consistent with RCW 49.17.180(1), and shall not exceed seventy thousand dollars.

(2) In addition, the director may cause a record of such fraudulent exemptions submission to be referred to the prosecuting attorney of the county wherein such submission occurred.

[Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-63-011, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW

49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-011, filed 11/6/86.]

WAC 296-63-013 Appeals. An employer may appeal the fee assessment or penalties in accordance with RCW 49.70.170(4).

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-013, filed 11/6/86.]

WAC 296-63-015 Fee assessment not received. When fee assessments are not received by the department, penalties shall be assessed to the delinquent employer in accordance with chapter 49.70 RCW and RCW 49.70.177.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 86-23-003 (Order 86-38), § 296-63-015, filed 11/6/86.]

Chapter 296-65 WAC

ASBESTOS REMOVAL AND ENCAPSULATION

WAC

296-65-001	Purpose and scope.
296-65-003	Definitions.
296-65-005	Asbestos worker training course content.
296-65-007	Asbestos supervisor training course content.
296-65-010	Asbestos worker certification.
296-65-012	Asbestos supervisor certification.
296-65-015	Training course approval.
296-65-017	Contractor certification.
296-65-020	Notification requirements.
296-65-025	Fees.
296-65-030	Methods of compliance.
296-65-035	Reciprocity.
296-65-050	Denial, suspension, and revocation of certificates.

DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-65-040	Appeals—Notice and filing. [Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-65-040, filed 4/27/87. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-040, filed 10/22/85.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.
296-65-045	Appeals—Procedure. [Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-045, filed 10/22/85.] Repealed by 87-24-051 (Order 87-24), filed 11/30/87. Statutory Authority: Chapter 49.17 RCW.

WAC 296-65-001 Purpose and scope. This standard regulates asbestos removal and encapsulation, requires contractor certification, specifies minimum training for supervisors and workers on asbestos projects, requires notification of asbestos projects, and establishes a training course approval program. This standard applies to the removal or encapsulation of any materials containing more than one percent asbestos.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-19-014, § 296-65-001, filed 9/5/97, effective 11/5/97. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-001, filed 10/10/89, effective 11/24/89. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-001, filed 10/22/85.]

WAC 296-65-003 Definitions. Unless the context clearly requires otherwise, the definitions in this section apply throughout this standard.

"Approved" means approved by the department.

[Title 296 WAC—p. 1882]

"Asbestos" includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.

"Asbestos fiber" means asbestos fiber as defined in WAC 296-62-07703 as "fiber."

"Asbestos abatement project" means an asbestos project involving three square feet or three linear feet, or more, of asbestos containing material.

"Asbestos project" includes the construction, demolition, repair, remodeling, maintenance or renovation of any public or private building or structure, mechanical piping equipment or system involving the demolition, removal, encapsulation, salvage, or disposal of material or outdoor activity releasing or likely to release asbestos fibers into the air.

"Certified asbestos contractor" means any partnership, firm, association, corporation or sole proprietorship, registered under chapter 18.27 RCW, that submits a bid, or contracts to remove or encapsulate asbestos for another and is certified by the department to remove or encapsulate asbestos.

"Certificate" means a certificate issued by the department that shall include the name of person awarded the certificate, certificate number, the discipline for which certification was conferred, training and examination dates, the course provider's name and address, and the course provider's telephone number, expiration date, and a statement that the person receiving the certificate has completed the training for asbestos accreditation under TSCA Title II.

"Certified asbestos supervisor" means an individual who is certified by the department under WAC 296-65-012.

"Certified asbestos worker" means an individual certified by the department under WAC 296-65-010.

"Department" means the department of labor and industries.

"Demolition" means the activity of razing a structure which includes the wrecking, removal, or dismantling of any load-supporting structural member of any facility including any related handling operations.

"Director" means the director of the department of labor and industries or the director's designee.

"Emergency project" means a project that was not planned but results from a sudden, unexpected event and does not include operations that are necessitated by nonroutine failures of equipment or systems.

"Encapsulation" means the application of an encapsulant to asbestos containing materials to control the release of asbestos fibers into the air. The encapsulation process either creates a membrane over the surface (bridging encapsulant) or penetrates the material and binds its components together (penetrating encapsulant).

"EPA MAP" means the environmental protection agency model accreditation plan for asbestos requirements in 40 CFR Part 763.

"HEPA filtration" means high-efficiency particulate air filtration found in respirators and vacuum systems capable of filtering 0.3 micron particles with 99.97% efficiency.

"Intact" means that the asbestos containing material has not crumbled, been pulverized, or otherwise deteriorated so that it is no longer likely to be bound with its matrix.

"NESHAP" means the National Emission Standards for Hazardous Air Pollutants.

"Owner" means the person who owns any public or private building, structure, facility, or mechanical system, or the remnants thereof, or the agent of such person, but does not include individuals who work on asbestos projects in their own single-family residences, no part of which is used for commercial purposes.

"Person" means any individual, partnership, firm, association, corporation, sole proprietorship, or the state of Washington or its political subdivisions.

"Revocation" means a permanent withdrawal of a certification issued by the department.

"Suspension" means a temporary withdrawal of a certification issued by the department. No suspension shall be less than six months or longer than one year.

[Statutory Authority: RCW 49.17.010, [49.17.]040, [49.17.]050, and 49.26.130. 00-06-075, § 296-65-003, filed 3/1/00, effective 4/10/00. Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-65-003, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-05-056, § 296-65-003, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-003, filed 10/10/89, effective 11/24/89; 87-24-051 (Order 87-24), § 296-65-003, filed 11/30/87. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-003, filed 10/22/85.]

WAC 296-65-005 Asbestos worker training course content. An approved asbestos worker training course shall consist of four days of training with a minimum of thirty-two hours. This initial training course shall provide, at a minimum, information on the following topics:

(1) The physical characteristics of asbestos including types, fiber size, aerodynamic characteristics and physical appearance.

(2) Examples of different types of asbestos and asbestos-containing materials. Real asbestos shall be used only for observation by trainees and shall be enclosed in sealed unbreakable containers.

(3) The health hazards of asbestos including the nature of asbestos related diseases, routes of exposure, dose-response relationships, synergism between cigarette smoking and asbestos exposure, latency period of diseases, hazards to immediate family, and the health basis for asbestos standards.

(4) Employee personal protective equipment including the classes and characteristics of respirator types, limitations of respirators, proper selection, inspection, donning, use, maintenance and storage procedure, methods for field checking of the facepiece-to-face seal (positive and negative-pressure checks), qualitative and quantitative fit testing procedures, variability between field and laboratory protection factors, factors that alter respirator fit (e.g., eye glasses and facial hair), the components of a proper respiratory protection program, respirator program administrator, requirements on oil lubricated reciprocating piston compressors for breathing air, and selection and use of personal protective clothing. Qualitative or quantitative fit testing shall be performed on at least one student for demonstration purposes and in accordance with WAC 296-62-07715 and 296-62-07739.

(5) Use, storage and handling of launderable clothing, nonslip footwear, gloves, eye protection and hard hats.

(6) Medical monitoring procedures and requirements, including the provisions of WAC 296-62-071 through 296-62-07121 and 296-62-07725, any additional recommended procedures and tests, benefits of medical monitoring and employee access to records.

(7) Air monitoring procedures and requirements specified in WAC 296-62-07709, including a description of equipment, sampling methods and strategies, reasons for air monitoring, types of samples, including area, personal and clearance samples, current standards with proposed changes if any, employee observation and notification, recordkeeping and employee access to records, interpretation of air monitoring results, and analytical methods for bulk and air samples.

(8) State-of-the-art work practices for asbestos removal and encapsulation activities including purpose, proper construction and maintenance of barriers and decontamination enclosure systems, posting of warning signs, electrical and ventilation system lock-out, proper working techniques and tools with vacuum attachments for minimizing fiber release, use of wet methods and surfactants, use of negative-pressure ventilation equipment for minimizing employee exposure to asbestos fibers and contamination prevention, scoring and breaking techniques for rigid asbestos products, glove bag techniques, recommended and prohibited work practices, potential exposure situations, emergency procedures for sudden releases, use of HEPA vacuums and proper clean-up and disposal procedures. Work practice requirements for removal, encapsulation, enclosure, repair, and waste transportation shall be discussed individually. Appropriate work practices for both indoor and outdoor asbestos projects shall be included.

(9) Personal hygiene including entry and exit procedures for the work area, use of showers and prohibition of eating, drinking, smoking and chewing (gum or tobacco) in the work area. Potential exposures, such as family exposure shall also be included.

(10) Additional safety hazards that may be encountered during asbestos removal and encapsulation activities and hazard abatement, including electrical hazards, scaffold and ladder hazards, slips, trips and falls, confined spaces, noise, and heat stress.

(11) The requirements, procedures and standards established by:

(a) The Environmental Protection Agency, 40 CFR Part 61, Subparts A and M, and 40 CFR Part 763.

(b) Washington state department of ecology.

(c) Local air pollution control agencies.

(d) Washington state department of labor and industries, division of industrial safety and health, chapter 49.17 RCW (Washington Industrial Safety and Health Act), chapter 49.26 RCW (Health and safety—Asbestos), and ensuing regulations.

(12) Actual worksite considerations.

(13) The instruction required by this section shall include, at a minimum fourteen hours of hands-on training for the following:

(a) Glove bag techniques;

(b) The opportunity to don respirators including half facepiece and full facepiece air purifying respirators, pow-

ered air purifying respirators (PAPR), and Type-C supplied-air respirators;

(c) Removal of sprayed-on or troweled-on material, and pipe lagging;

(d) Basic construction of a decontamination unit, and proper entry and exit;

(e) Suit-up in protective clothing consisting of coveralls, foot coverings and head coverings.

(14) Course review, a review of the key aspects of the training course.

(15) Asbestos-containing materials shall not be used for hands-on training.

(16) In recognition that asbestos abatement is an evolving industry, the department reserves the right to require additional subjects to be taught and to specify the amount of time which shall be allotted to adequately cover required subjects. To assure adequate coverage of required material, each sponsor shall be provided and required to incorporate into the training course, a detailed outline of subject matter developed by the department.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-05-056, § 296-65-005, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-005, filed 10/10/89, effective 11/24/89; 87-24-051 (Order 87-24), § 296-65-005, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-65-005, filed 4/27/87. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-005, filed 10/22/85.]

WAC 296-65-007 Asbestos supervisor training course content. An approved asbestos supervisor training course shall consist of at least five days of training. This initial training course shall include lectures, demonstrations, at least fourteen hours of hands-on training, course review and a written examination. Audio-visual materials, where appropriate, are recommended to complement lectures. The training course shall provide, at a minimum, information on the following topics:

(1) The physical characteristics of asbestos and asbestos-containing materials including identification of asbestos, aerodynamic characteristics, typical uses, physical appearance, hazard assessment considerations, and a summary of abatement control options.

(2) Health effects related to asbestos exposure including the nature of asbestos related diseases, routes of exposure, dose-response relationships and the lack of a safe level of exposure, synergism between asbestos exposure and cigarette smoking, latency period, hazards to the immediate family and the health basis for the standard.

(3) Employee personal protective equipment including the classes and characteristics of respirator types, limitations of respirators, proper selection, inspection, donning, use, maintenance, and storage procedures, methods for field checking of the facepiece-to-face seal (positive and negative pressure checks), variability between field and laboratory protection factors, quantitative and qualitative fit test requirements, factors that alter respirator fit (facial hair, scars, etc.), the components of a proper respirator program, requirements for oil lubricated reciprocating compressors, maintenance of Type-C systems, standards for breathing air, selection and use of personal protective clothing, use, stor-

age, and handling of nondisposable clothing, and regulations covering personal protective equipment.

(4) State-of-the-art work practices for asbestos removal and encapsulation activities including purpose, proper construction and maintenance of barriers and decontamination enclosure systems, posting of warning signs, electrical and ventilation system lock-out, proper working techniques and tools with vacuum attachments for minimizing fiber release, use of wet methods and surfactants, use of negative-pressure ventilation equipment for minimizing employee exposure to asbestos fibers and contamination prevention, scoring and breaking techniques for rigid asbestos products, glove bag techniques, recommended and prohibited work practices, potential exposure situations, emergency procedures for sudden releases, use of HEPA vacuums and proper clean-up and disposal procedures. Work practice requirements for removal, encapsulation, and repair shall be discussed separately. Appropriate work practices for both indoor and outdoor asbestos projects shall be included.

(5) Personal hygiene including entry and exit procedures for the work area, use of showers and prohibition of eating, drinking, smoking, and chewing (gum and tobacco) in the work area. Potential exposures, such as family exposure shall also be included.

(6) Additional safety hazards that may be encountered during asbestos abatement activities and how to deal with them, including electrical hazards, heat stress, air contaminants other than asbestos, fire and explosion hazards, scaffold and ladder hazards, slips, trips, and falls, confined space entry requirements, and noise hazards.

(7) Medical monitoring procedures and requirements, including the provisions of WAC 296-62-071 through 296-62-07121 and 296-62-07725, any additional recommended procedures and tests, benefits of medical monitoring and recordkeeping requirements.

(8) Air monitoring procedures and requirements specified in WAC 296-62-07709, including a description of equipment, sampling methods and strategies, reasons for air monitoring, types of samples, including area, personal and clearance samples, a description of aggressive sampling, current standards with proposed changes if any, employee observation and notification, recordkeeping, interpretation of air monitoring results, specifically from analyses performed by polarized light, phase contrast, and electron microscopy.

(9) The requirements, procedures, and standards established by:

(a) The Environmental Protection Agency, 40 CFR Part 61, Subparts A and M, and 40 CFR Part 763.

(b) The Washington state department of ecology.

(c) Local air pollution control agencies.

(d) Washington state department of labor and industries, division of industrial safety and health, chapter 49.17 RCW (Washington Industrial Safety and Health Act), chapter 49.26 RCW (Health and safety—Asbestos), and ensuing regulations.

(10) Actual worksite considerations.

(11) Insurance and liability issues including contractor issues, industrial insurance coverage and exclusions, third party liabilities and defenses, private insurance coverage and

exclusions, recordkeeping recommended for legal and insurance purposes.

(12) Supervisory techniques for asbestos abatement projects including supervisory practices to enforce and reinforce the required work practices and discourage unsafe work practices.

(13) Contract specifications including a discussion of the key elements to be included in contract specifications.

(14) A minimum of fourteen hours of hands-on training for the following:

(a) Calibration of air-sampling equipment;

(b) Routine maintenance of air-purifying and air-supplied respirators;

(c) Setup of a decontamination unit including calculating the number of negative air machines needed as well as proper placement of the machines within the enclosure; and

(d) Quantitative and qualitative fit-testing protocols.

(15) Course review, a review of the key aspects of the training course.

(16) In recognition that asbestos abatement is an evolving industry, the department reserves the right to require additional subjects to be taught and to specify the amount of time which shall be allotted to adequately cover required subjects. To assure adequate coverage of required material, each sponsor shall be provided and required to incorporate into their training course, a detailed outline of subject matter developed by the department.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-05-056, § 296-65-007, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-007, filed 10/10/89, effective 11/24/89.]

WAC 296-65-010 Asbestos worker certification. (1)

For the purposes of this section "individual" means any natural person.

(2) To qualify for an asbestos worker certificate, an individual must do the following:

(a) Successfully complete an approved asbestos worker training course;

(b) Achieve a score of at least seventy percent on a one hundred question multiple choice closed book examination approved by the department but administered by the training course sponsor. If an individual does not pass the examination, then another examination (meeting the above criteria) may be given after a sufficient period of study. The new examination must not duplicate more than fifty percent of the questions used on prior examinations;

(c) Submit to the department a timely application validated by an approved training course sponsor. To be considered timely, an application must be received by the department no later than sixty days after the completion of the course. In the event that an application is not timely, the individual will be required to pass, with a score of at least seventy percent, an examination administered by the department. A nonrefundable fifty-dollar fee will be assessed when the application is submitted to the department; and

(d) Pay the fee prescribed in WAC 296-65-025.

(3) Individuals must not perform any asbestos project work prior to issuance of the certificate.

(4) Certificates will be issued and mailed to the individual applicants and will be valid for one year from the date of issuance.

(5) Certified asbestos workers shall attend an eight-hour worker refresher course prior to certificate renewal.

(a) The course shall, at a minimum, adequately review the subjects required by WAC 296-65-005, update information on state-of-the-art procedures and equipment, and review regulatory changes and interpretations. The department may require specific subjects.

(b) An application for renewal of the certificate must be validated by the refresher training course instructor.

(c) The refresher course must be taken prior to expiration of the certificate.

(d) The department must receive the certificate renewal application no later than the expiration date of the current certificate. Applicants missing this renewal deadline will be required to pass, with a score of seventy percent, an examination administered by the department. A nonrefundable fifty-dollar fee will be charged to take this examination.

(e) Individuals whose certificates have been expired for more than six months will be required to retake the entire basic worker course.

(6) The initial TSCA Title II worker accreditation certificate and the current worker certificate must be available for inspection at all times at the location of the asbestos project.

(7) The department may suspend or revoke a certificate as provided in WAC 296-65-050 and chapter 296-350 WAC.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-65-010, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-05-056, § 296-65-010, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-010, filed 10/10/89, effective 11/24/89. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-010, filed 10/22/85.]

WAC 296-65-012 Asbestos supervisor certification.

(1) For the purposes of this section, "individual" means any natural person.

(2) To qualify for an asbestos supervisor certificate, an individual must meet the following criteria:

(a) Have at least 1600 hours of experience in one or more of the following disciplines:

(i) Asbestos abatement;

(ii) Asbestos project design;

(iii) Consultation on asbestos abatement projects;

(iv) Operations and maintenance program supervision;

(v) Construction project supervision;

(b) Successfully complete an approved asbestos supervisor training course;

(c) Achieve a score of at least seventy percent on a one hundred question multiple choice closed book examination approved by the department but administered by the training course sponsor. If an individual does not pass the examination, then another examination (meeting the above criteria) may be given after a sufficient period of study. The new examination must not duplicate more than fifty percent of the questions used on prior examinations;

(d) Submit to the department a timely application validated by an approved training course sponsor. To be considered timely, an application must be received by the depart-

ment no later than sixty days after the completion of the course. In the event that an application is not timely, the individual will be required to pass, with a score of at least seventy percent, an examination administered by the department. A nonrefundable fifty-dollar fee will be assessed when the application is submitted to the department; and

(e) Pay the fee prescribed in WAC 296-65-025.

(3) An individual must not supervise any asbestos project prior to issuance of the certificate.

(4) Certificates will be issued and mailed to the individual applicants and will be valid for one year from the date of issuance.

(5) A certified asbestos supervisor must attend an eight-hour supervisor refresher course prior to certificate renewal. It is not necessary to also take a worker refresher course.

(a) The course must, at a minimum, adequately review the subjects required by WAC 296-65-007, update information on state-of-the-art procedures and equipment, and review regulatory changes and interpretations. The department may require specific subjects.

(b) An application for renewal of the certificate must be validated by the refresher training course instructor.

(c) The refresher course must be taken prior to expiration of the certificate.

(d) The department must receive the certificate renewal application no later than the expiration date of the current certificate. Applicants missing this renewal deadline will be required to pass, with a score of seventy percent, an examination administered by the department. A nonrefundable fifty-dollar fee will be charged to take this examination.

(e) Individuals whose certificates have been expired for more than six months will be required to retake the entire basic supervisor course.

(6) The initial TSCA Title II supervisor accreditation certificate and the current supervisor certificate must be available for inspection at all times at the location of the asbestos project.

(7) The department may suspend or revoke a certificate as provided in WAC 296-65-050 and chapter 296-350 WAC.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130, 99-17-026, § 296-65-012, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060, 96-05-056, § 296-65-012, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW, 89-21-018 (Order 89-10), § 296-65-012, filed 10/10/89, effective 11/24/89.]

WAC 296-65-015 Training course approval. (1) Basic and refresher asbestos training courses may be sponsored by any individual, person, or other entity having department approval. Approval shall be contingent on the sponsor's compliance, as applicable, with licensing requirements established by the state board of vocational education.

(2) Prior to receiving department approval, each course shall be evaluated by the department for the breadth of knowledge and experience required to properly train asbestos workers or supervisors. Course content shall be carefully scrutinized for adequacy and accuracy. Training techniques will be evaluated by the department.

(3) Sponsors of basic and refresher training courses proposed for approval must submit:

(a) Background information about course sponsors;

(b) Course locations and fees;

(c) Copies of course handouts;

(d) A detailed description of course content and the amount of time allotted to each major topic;

(e) A description of teaching methods to be utilized and a list of all audio-visual materials; the department may, in its discretion, request that copies of the materials be provided for review. Any audio-visual materials provided to the department will be returned to the applicant;

(f) A list of all personnel involved in course preparation and presentation and a description of the background, special training and qualifications of each. Instructors shall have academic and/or field experience in asbestos abatement. The department may, in its discretion, require proposed instructors to pass an examination on subjects related to their respective topics of instruction;

(g) A description of student evaluation methods and a copy of the required written examination including the scoring methodology to be used in grading the examination;

(h) A description of course evaluation methods;

(i) Any restrictions on attendance (language, class size, affiliation, etc.);

(j) A list of any other states that currently approve the training course;

(k) A letter from the course provider that clearly indicates how the course provider meets the EPA MAP requirements; and

(l) The amount and type of hands-on training for initial training courses.

(4) Application for training course approval and course materials shall be submitted to the department at least sixty days prior to the requested approval date. Materials may be mailed to:

Asbestos Certification Program
Department of Labor and
Industries
P.O. Box 44614
Olympia, Washington 98504-4614

(5) The decision to grant or renew approval of a basic or refresher asbestos training course shall be in the sole discretion of the department.

Following approval of a basic or refresher asbestos training course, the department will issue the course sponsor an approval which is valid for one year from the date of issuance. Application for renewal must follow the procedures described in subsections (3) and (4) of this section.

Following approval of a basic or refresher asbestos training course, in recognition that asbestos abatement is an evolving industry, the department reserves the right to require additional subjects to be taught and to specify the amount of time which shall be allotted to adequately cover required subjects. To assure adequate coverage of required material, each sponsor shall be provided and required to incorporate into their training course, a detailed outline of subject matter developed by the department.

(6) To be considered timely, the training course approval renewal must be received by the department no later than thirty days before the certificate expiration date.

(7) Any changes to a training course must be approved by the department in advance.

(8) The course sponsor shall provide the department with a list of all persons who have completed a basic or refresher training course. The list must be provided no later than ten days after a course is completed and must include the name and address of each trainee.

(9) The course sponsor must notify the department, in writing, at least fourteen days before a training course is scheduled to begin. The notification must include the date, time and address where the training will be conducted.

(10) A representative of the department may, at the department's discretion, attend a training course as an observer to verify that the training course is conducted in accordance with the program approved by the department.

(11) Course sponsors conducting training outside the state of Washington shall reimburse the department for reasonable travel expenses associated with department audits of the training courses. Reasonable travel expenses are defined as current state of Washington per diem and travel allowance rates including airfare and/or surface transportation rates. Such reimbursement shall be paid within thirty days of receipt of the billing notice.

(12) The training course sponsor shall limit each class to a maximum of thirty participants.

(13) The instructor to student ratio shall not exceed one-to-ten for any of the training required by WAC 296-65-005(13) and 296-65-007(14).

(14) The department may terminate the training course approval, if in the department's judgment the sponsor fails to maintain the course content and quality as initially approved, or fails to make changes to a course as required by WAC 296-65-015(5). The minimum criteria for withdrawal of training course approval shall include:

(a) Misrepresentation of the extent of training courses approval by a state or EPA;

(b) Failure to submit required information or notification in a timely manner;

(c) Failure to maintain requisite records;

(d) Falsification of accreditation records, instructor qualifications, or other accreditation information; or

(e) Failure to adhere to the training standards and accreditation requirements of chapter 296-65 WAC.

(15) Any "notice of termination of training course approval" issued by the department may act as an order of immediate restraint as described by RCW 49.17.130.

(16) Recordkeeping requirements for training providers: All approved providers of accredited asbestos training courses must comply with the following minimum recordkeeping requirements:

(a) Training course materials. A training provider must retain copies of all instructional materials used in delivery of the classroom training such as student manuals, instructor notebooks and handouts.

(b) Instructor qualifications. A training provider must retain copies of all instructors' resumes, and the documents approving each instructor issued by either EPA or the department. Instructors must be approved by the department before teaching courses for accreditation purposes. A training provider must notify the department in advance whenever it

changes course instructors. Records must accurately identify the instructors that taught each particular course for each date that a course is offered.

(c) Examinations. A training provider must document that each person who receives an accreditation certificate for an initial training course has achieved a passing score on the examination. These records must clearly indicate the date upon which the exam was administered, the training course and discipline for which the exam was given, the name of the person who proctored the exam, a copy of the exam, and the name and test score of each person taking the exam. The topic and dates of the training course must correspond to those listed on that person's accreditation certificate.

(d) Accreditation certificates. The training providers shall maintain records that document the names of all persons who have been awarded certificates, their certificate numbers, the disciplines for which accreditation was conferred, training and expiration dates, and the training location. The training provider shall maintain the records in a manner that allows verification by telephone of the required information.

(e) Verification of certificate information. Training providers of refresher training courses shall confirm that their students possess valid accreditation before granting course admission.

(f) Records retention and access.

(i) The training provider shall maintain all required records for a minimum of three years. The training provider, however, may find it advantageous to retain these records for a longer period of time.

(ii) The training provider must allow reasonable access to all of the records required by the MAP, and to any other records which may be required by the department for the approval of asbestos training providers or the accreditation of asbestos training courses, to both EPA and to the department, on request.

(iii) If a training provider ceases to conduct training, the training provider shall notify the department and give it the opportunity to take possession of that provider's asbestos training records.

(17) A representative of the department may, at the department's discretion, provide an examination as a substitution to the examination administered by the training course provider. The examination replacement will be used to verify that the training course is conducted in accordance with the program approved by the department.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 97-01-079, § 296-65-015, filed 12/17/96, effective 3/1/97; 96-05-056, § 296-65-015, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-015, filed 10/10/89, effective 11/24/89; 87-24-051 (Order 87-24), § 296-65-015, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-65-015, filed 4/27/87. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-015, filed 10/22/85.]

WAC 296-65-017 Contractor certification. (1) In order to obtain certification, an asbestos contractor must submit an application to the department. The application shall provide the following information:

(a) A list of asbestos projects conducted by the contractor during the previous twelve months. Such list shall include for each project:

- (i) Project name;
 - (ii) Location;
 - (iii) Brief description;
 - (iv) Identity of any citations or enforcement actions issued for violations of asbestos regulations by any local, state, or federal jurisdiction relative to each individual project; and
 - (v) Name of the on-site project manager or supervisor.
- (b) A list of asbestos supervisors (include certification number) working for the company.
- (c) A statement certifying that the contractor has read and understands all applicable Washington state rules and regulations regarding asbestos abatement and will comply with them.
- (d) A statement certifying that the applicant contractor's asbestos license or accreditation issued by any other state or jurisdiction has not been revoked, suspended, or denied by that state or jurisdiction.
- (2) Upon approval, the department will issue the contractor a certificate. Denial of approval shall be in writing.
- (3) Certificates shall be valid for a period of twelve months. Certificates may be extended during department review of a renewal application.

Note: In circumstances where it is necessary to coordinate an expiration date with the date of expiration of a contractor registration issued under chapter 18.27 RCW, certificates may be valid for less than one year. In such circumstances, the certificate fee prescribed in WAC 296-65-025 shall be prorated accordingly for the initial application only.

- (4) The application for certificate renewal shall contain the information specified in subsection (1) of this section.
- (5) Applications for renewal must be received by the department not less than sixty days before the certificate expires.
- (6) The department may suspend or revoke the certificate as provided in WAC 296-65-050 and chapter 296-350 WAC.

[Statutory Authority: Chapter 49.17 RCW, 89-21-018 (Order 89-10), § 296-65-017, filed 10/10/89, effective 11/24/89.]

WAC 296-65-020 Notification requirements. (1)

Before any person or individual begins an asbestos project as defined in WAC 296-62-07722 and 296-65-003 involving more than forty-eight square feet or ten linear feet, unless the surface area of the pipe is greater than forty-eight square feet, of asbestos containing material, written notification must be provided to the department. Notices must include:

- (a) Name and address of the owner and contractor.
- (b) Description of the facility including size, age, and prior use of the facility.
- (c) Amount of asbestos-containing material to be removed or encapsulated.
- (d) Location of the facility.
- (e) Exact starting and completion dates of the asbestos project, including shifts during which abatement work will be accomplished. These dates must correspond to the dates specified for asbestos removal in the contract. Any change in these dates or work shifts must be communicated to the department by an amended notice filed at the office where the original notice was filed.

- When the starting date or time changes, the amended notice must be filed no later than 5:00 p.m. on the business day prior to the starting date in the original notice and prior to the new starting date.

- When the completion date or time changes, the amended notice must be filed before completion of the project, and within eight hours from when the person learns that the change will occur.

Notice may be filed by facsimile (FAX).

(f) Nature of the project and methods used to remove or encapsulate the material.

(2) Notices must be received by the department no later than ten days prior to the start of the project. Notices must be sent directly to the department of labor and industries regional office having jurisdiction on the project.

(3) The director may waive the prenotification requirement upon written request of an owner for large-scale, ongoing projects. In granting such a waiver, the director will require the owner to provide prenotification if significant changes in personnel, methodologies, equipment, work site, or work procedures occur or are likely to occur. The director will further require annual resubmittal of such notification.

(4) The director, upon review of an owner's reports, work practices, or other data available as a result of inspections, audits, or other authorized activities, may reduce the size threshold for prenotification required by this section. Such a change will be based on the director's determination that significant problems in personnel, methodologies, equipment, work site, or work procedures are creating the potential for violations of this chapter.

(5) Emergency projects which disturb or release asbestos into the air must be reported to the department within three working days after commencement of the project in the manner otherwise required under this chapter. The employees, the employees' collective bargaining representative or employee representative, if any, and other persons at the project area must be notified of the emergency as soon as possible by the person undertaking the emergency project. A notice describing the nature of the emergency project must be clearly posted adjacent to the work area.

(6) Incremental phasing in the conduct or design of asbestos projects or otherwise conducting or designing asbestos projects of a size less than the threshold exemption specified in subsection (1) of this section, with the intent of avoiding the notification requirements, is a violation of this chapter.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130, 99-17-026, § 296-65-020, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060, 96-05-056, § 296-65-020, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW, 89-21-018 (Order 89-10), § 296-65-020, filed 10/10/89, effective 11/24/89; 87-24-051 (Order 87-24), § 296-65-020, filed 11/30/87. Statutory Authority: RCW 49.17.050(2) and 49.17.040, 87-10-008 (Order 87-06), § 296-65-020, filed 4/27/87. Statutory Authority: SSB 4209, 1985 c 387, 85-21-080 (Order 85-30), § 296-65-020, filed 10/22/85.]

WAC 296-65-025 Fees. (1) A nonrefundable administrative fee of twenty-five dollars will be assessed for each initial, replacement, or renewal asbestos worker certificate application. The fee (check or money order) must accompany the certificate application and be made payable to the depart-

ment. An application form may be obtained from any approved training course instructor or directly from the department.

(2) A nonrefundable administrative fee of thirty-five dollars will be assessed for each initial, replacement, or renewal asbestos supervisor certificate application. The fee (check or money order) must accompany the certificate application and be made payable to the department. An application form may be obtained from any approved training course instructor or directly from the department.

(3) A nonrefundable administrative fee of one thousand dollars will be assessed for each initial or renewal contractor certificate application. The fee (check or money order) must accompany the certificate application and be made payable to the department. An application form may be obtained from the department.

Note: In circumstances where it is necessary to coordinate an expiration date with the date of expiration of a contractor registration issued under chapter 18.27 RCW, certificates may be valid for less than one year. In such circumstances, the certificate fee prescribed in WAC 296-65-025 will be prorated accordingly for the initial application only.

(4) A nonrefundable administrative fee of one thousand dollars will be assessed for each initial and renewal application for training course approval. A check or money order must accompany any application made under the provisions of WAC 296-65-015.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040, and 49.26.130. 99-17-026, § 296-65-025, filed 8/10/99, effective 11/10/99. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-025, filed 10/10/89, effective 11/24/89; 87-24-051 (Order 87-24), § 296-65-025, filed 11/30/87. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-025, filed 10/22/85.]

WAC 296-65-030 Methods of compliance. (1) Before submitting a bid or working on an asbestos abatement project, any person or individual must obtain an asbestos contractor certificate as provided in WAC 296-65-017 and must have in its employ at least one certified asbestos supervisor responsible for supervising all asbestos projects undertaken by the contractor.

(2) A certified asbestos supervisor will not be required on asbestos projects involving less than three square feet or three linear feet of asbestos-containing material unless the surface area of the pipe is greater than three square feet. A certified asbestos supervisor is required for all Class I and II asbestos work in accordance with WAC 296-62-07728(4).

(3) No employee or other individual is eligible to do work or supervise an asbestos project without being issued a certificate by the department.

(a) Employees performing Class I or Class II asbestos work must be certified asbestos workers as specified in WAC 296-62-07722.

(b) Employees performing Class III or Class IV asbestos work specified by WAC 296-62-07722 as an asbestos project shall be certified asbestos workers.

(4) No person may assign any employee, contract with, or permit any individual, to work on an asbestos project as specified in WAC 296-62-07722 in any facility without the project being performed by a certified asbestos worker.

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(5) A certified asbestos supervisor must provide direct, on-site supervision for an asbestos project. When an employer conducts an asbestos abatement project in its own facility by its own certified employees, supervision may be performed in the regular course of a certified asbestos supervisor's duties. Asbestos workers must have access to and be under the control of certified asbestos supervisors throughout the duration of the project.

(6) Any construction, renovation, remodeling, maintenance, repair, or demolition which was started without meeting the requirements of this section must be halted immediately and cannot be resumed before meeting such requirements.

[Statutory Authority: RCW 49.17.040, 49.17.050, 49.26.040 and 49.26.130. 99-17-026, § 296-65-030, filed 8/10/99, effective 11/10/99. Statutory Authority: RCW 49.17.040, [49.17.050 and [49.17.060. 97-19-014, § 296-65-030, filed 9/5/97, effective 11/5/97; 96-05-056, § 296-65-030, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-030, filed 10/10/89, effective 11/24/89. Statutory Authority: RCW 49.17.050(2) and 49.17.040. 87-10-008 (Order 87-06), § 296-65-030, filed 4/27/87. Statutory Authority: SSB 4209, 1985 c 387. 85-21-080 (Order 85-30), § 296-65-030, filed 10/22/85.]

WAC 296-65-035 Reciprocity. (1) The department may recognize certifications issued by another state for asbestos workers or supervisors provided that:

(a) The worker is in possession of a currently valid certification from the other state; and

(b) The department evaluates the other state's qualification procedures and determines the certification to be equivalent to the minimum requirements of this chapter.

(2) When the department's evaluation of another state's qualification procedures identifies that equivalent requirements are met, the department is authorized to issue a Washington state certification upon receipt of a completed application.

(3) When the department's evaluation of another state's qualification procedures identifies deficiencies, the department may require specific supplemental training and/or examination before issuing a Washington state certification.

[Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-035, filed 10/10/89, effective 11/24/89.]

WAC 296-65-050 Denial, suspension, and revocation of certificates. (1) The department may deny, suspend, or revoke a certificate for failure of the holder to comply with any requirement of this chapter or any applicable health and safety standards and regulations.

(2) The criteria for decertification for asbestos workers, supervisors, and contractors shall include:

(a) Performing work requiring accreditation at a job site without being in physical possession of initial and current accreditation certificates;

(b) Permitting the duplication or use of one's own accreditation certificate by another;

(c) Performing work for which accreditation has not been received; or

(d) Obtaining accreditation from a training provider that does not have approval to offer training for the particular discipline from either EPA or from a state that has a contractor accreditation plan at least as stringent as the EPA MAP.

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(3) The following persons are not certified for the purposes of this chapter and their respective certificate(s) shall be revoked by the department:

(a) Any person who obtains accreditation through fraudulent representation of training or examination documents;

(b) Any person who obtains training documentation through fraudulent means;

(c) Any person who gains admission to and completes refresher training through fraudulent representation of initial or previous refresher training documentation; or

(d) Any person who obtains accreditation through fraudulent representation of accreditation requirements such as education, training, professional registration, or experience.

(4) Before any certificate may be denied, suspended, or revoked, the holder thereof shall be given written notice of the department's intention to do so, mailed by registered mail, return receipt requested, to the holder's last known address. The notice shall enumerate the allegations against such holder and shall give him or her the opportunity to request a conference before the department. At such conference, the department and the holder shall have opportunity to produce witnesses and give testimony.

(5) A denial, suspension, or revocation order may be appealed to the board of industrial insurance appeals within fifteen working days after the denial, suspension, or revocation order is entered. The notice of appeal may be filed with the department or the board of industrial insurance appeals. The board of industrial insurance appeals shall hold the hearing in accordance with procedures established in RCW 49.17.140. Any party aggrieved by an order of the board of industrial insurance appeals may obtain superior court review in the manner provided in RCW 49.17.150.

(6) The department may suspend or revoke any certificate issued under this chapter for a period of not less than six months upon the following grounds:

(a) The certificate was obtained through error or fraud; or

(b) The holder thereof is judged to be incompetent to carry out the work for which the certificate was issued.

[Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-05-056, § 296-65-050, filed 2/16/96, effective 4/1/96. Statutory Authority: Chapter 49.17 RCW. 89-21-018 (Order 89-10), § 296-65-050, filed 10/10/89, effective 11/24/89.]

Chapter 296-67 WAC

SAFETY STANDARDS FOR PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS

WAC

296-67-001	Process safety management of highly hazardous chemicals.
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296-67-009	Employee participation.
296-67-013	Process safety information.
296-67-017	Process hazard analysis.
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296-67-045	Management of change.
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296-67-057	Compliance audits.
296-67-061	Trade secrets.
296-67-285	Appendix A—List of highly hazardous chemicals, toxics and reactives (mandatory).
296-67-289	Appendix B—Block flow diagram and simplified process flow diagram (nonmandatory).
296-67-291	Appendix C—Compliance guidelines and recommendations for process safety management (nonmandatory).
296-67-293	Appendix D—Sources of further information (nonmandatory).

WAC 296-67-001 Process safety management of highly hazardous chemicals. (1) Purpose. This section contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire, or explosion hazards.

(2) Application.

(a) This part applies to the following:

(i) A process which involves a chemical at or above the specified threshold quantities listed in WAC 296-67-285, Appendix A;

(ii) A process which involves a flammable liquid or gas (as defined in WAC 296-62-05405) on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more except for:

(A) Hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical covered by this standard;

(B) Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

(b) This part does not apply to:

(i) Retail facilities;

(ii) Oil or gas well drilling or servicing operations; or

(iii) Normally unoccupied remote facilities.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-001, filed 8/10/92, effective 9/10/92.]

WAC 296-67-005 Definitions. "Atmospheric tank" means a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g. (pounds per square inch gauge, 3.45 Kpa).

"Boiling point" means the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). For the purposes of this part, where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, the 10 percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, may be used as the boiling point of the liquid.

"Catastrophic release" means a major uncontrolled emission, fire, or explosion, involving one or more highly hazardous chemicals, that presents serious danger to employees in the workplace.

"Facility" means the buildings, containers, or equipment which contain a process.

"Highly hazardous chemical" means a substance possessing toxic, reactive, flammable, or explosive properties and specified by WAC 296-67-001 (2)(a).

(2001 Ed.)

"Hot work" means work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.

"Normally unoccupied remote facility" means a facility which is operated, maintained, or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operating or maintenance tasks. No employees are permanently stationed at the facility. Facilities meeting this definition are not contiguous with, and must be geographically remote from all other buildings, processes, or persons.

"Process" means any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or the on-site movement of such chemicals, or combination of these activities. For purposes of this definition, any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.

"Replacement in kind" means a replacement which satisfies the design specification.

"Trade secret" means any confidential formula, pattern, process, device, information, or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Chapter 296-62 WAC, Part C, sets out the criteria to be used in evaluating trade secrets.

[Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-67-005, filed 10/20/93, effective 12/1/93; 92-17-022 (Order 92-06), § 296-67-005, filed 8/10/92, effective 9/10/92.]

WAC 296-67-009 Employee participation. (1)

Employers shall develop a written plan of action regarding the implementation of the employee participation required by this section.

(2) Employers shall consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management in this standard.

(3) Employers shall provide to employees and their representatives access to process hazard analyses and to all other information required to be developed under this standard.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-009, filed 8/10/92, effective 9/10/92.]

WAC 296-67-013 Process safety information. In

accordance with the schedule set forth in WAC 296-67-017, the employer shall complete a compilation of written process safety information before conducting any process hazard analysis required by the standard. The compilation of written process safety information is to enable the employer and the employees involved in operating the process to identify and understand the hazards posed by those processes involving highly hazardous chemicals. This process safety information shall include information pertaining to the hazards of the highly hazardous chemicals used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

(2001 Ed.)

(1) Information pertaining to the hazards of the highly hazardous chemicals in the process. This information shall consist of at least the following:

- (a) Toxicity information;
- (b) Permissible exposure limits;
- (c) Physical data;
- (d) Reactivity data;
- (e) Corrosivity data;
- (f) Thermal and chemical stability data; and
- (g) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur.

Note: Material Safety Data Sheets meeting the requirements of WAC 296-62-05413 may be used to comply with this requirement to the extent they contain the information required by this section.

(2) Information pertaining to the technology of the process.

(a) Information concerning the technology of the process shall include at least the following:

- (i) A block flow diagram or simplified process flow diagram (see WAC 296-67-289, Appendix B);
- (ii) Process chemistry;
- (iii) Maximum intended inventory;
- (iv) Safe upper and lower limits for such items as temperatures, pressures, flows, or compositions; and
- (v) An evaluation of the consequences of deviations, including those affecting the safety and health of employees.

(b) Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

(3) Information pertaining to the equipment in the process.

(a) Information pertaining to the equipment in the process shall include:

- (i) Materials of construction;
- (ii) Piping and instrument diagrams (P&IDs);
- (iii) Electrical classification;
- (iv) Relief system design and design basis;
- (v) Ventilation system design;
- (vi) Design codes and standards employed;
- (vii) Material and energy balances for processes built after May 26, 1992; and
- (viii) Safety systems (e.g., interlocks, detection, or suppression systems).

(b) The employer shall document that equipment complies with recognized and generally accepted good engineering practices.

(c) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-013, filed 8/10/92, effective 9/10/92.]

WAC 296-67-017 Process hazard analysis. (1) The employer shall perform an initial process hazard analysis (hazard evaluation) on processes covered by this standard. The process hazard analysis shall be appropriate to the com-

plexity of the process and shall identify, evaluate, and control the hazards involved in the process. Employers shall determine and document the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. The process hazard analysis shall be conducted as soon as possible, but not later than the following schedule:

- (a) No less than 25 percent of the initial process hazards analyses shall be completed by May 26, 1994;
- (b) No less than 50 percent of the initial process hazards analyses shall be completed by May 26, 1995;
- (c) No less than 75 percent of the initial process hazards analyses shall be completed by May 26, 1996;
- (d) All initial process hazards analyses shall be completed by May 26, 1997;
- (e) Process hazards analyses completed after May 26, 1987, which meet the requirements of this section are acceptable as initial process hazards analyses. These process hazard analyses shall be updated and revalidated, based on their completion date, in accordance with this section.

(2) The employer shall use one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed.

- (a) What-If;
- (b) Checklist;
- (c) What-If/Checklist;
- (d) Hazard and Operability Study (HAZOP);
- (e) Failure Mode and Effects Analysis (FMEA);
- (f) Fault Tree Analysis; or
- (g) An appropriate equivalent methodology.

(3) The process hazard analysis shall address:

- (a) The hazards of the process;
- (b) The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace;
- (c) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors);
- (d) Consequences of failure of engineering and administrative controls;
- (e) Facility siting;
- (f) Human factors; and
- (g) A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.

(4) The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

(5) The employer shall establish a system to promptly address the team's findings and recommendations; assure that

the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance, and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.

(6) At least every five years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements of this section, to assure that the process hazard analysis is consistent with the current process.

(7) Employers shall retain process hazards analyses and updates or revalidations for each process covered by this part, as well as the documented resolution of recommendations described in this section for the life of the process.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-017, filed 8/10/92, effective 9/10/92.]

WAC 296-67-021 Operating procedures. (1) The employer shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.

(a) Steps for each operating phase:

- (i) Initial startup;
- (ii) Normal operations;
- (iii) Temporary operations;

(iv) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner;

- (v) Emergency operations;
- (vi) Normal shutdown; and

(vii) Startup following a turnaround, or after an emergency shutdown.

(b) Operating limits:

- (i) Consequences of deviation; and
- (ii) Steps required to correct or avoid deviation.

(c) Safety and health considerations:

(i) Properties of, and hazards presented by, the chemicals used in the process;

(ii) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;

(iii) Control measures to be taken if physical contact or airborne exposure occurs;

(iv) Quality control for raw materials and control of hazardous chemical inventory levels; and

- (v) Any special or unique hazards.

(d) Safety systems and their functions.

(2) Operating procedures shall be readily accessible to employees who work in or maintain a process.

(3) The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities.

(4) The employer shall certify annually that these operating procedures are current and accurate.

(5) The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-021, filed 8/10/92, effective 9/10/92.]

WAC 296-67-025 Training. (1) Initial training.

(a) Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures as specified in WAC 296-67-021. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.

(b) In lieu of initial training for those employees already involved in operating a process on May 26, 1992, an employer may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

(2) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. The employer, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.

(3) Training documentation. The employer shall ascertain that each employee involved in operating a process has received and understood the training required by this section. The employer shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-025, filed 8/10/92, effective 9/10/92.]

WAC 296-67-029 Contractors. (1) Application. This section applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery, or other supply services.

(2) Employer responsibilities.

(a) The employer, when selecting a contractor, shall obtain and evaluate information regarding the contract employer's safety performance and programs.

(b) The employer shall inform contract employers of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.

(2001 Ed.)

(c) The employer shall explain to contract employers the applicable provisions of the emergency action plan required by WAC 296-67-053.

(d) The employer shall develop and implement safe work practices consistent with WAC 296-67-021, to control the entrance, presence, and exit of contract employers and contract employees in covered process areas.

(e) The employer shall periodically evaluate the performance of contract employers in fulfilling their obligations as specified in subsection (3) of this section.

(f) The employer shall maintain a contract employee injury and illness log related to the contractor's work in process areas.

(3) Contract employer responsibilities.

(a) The contract employer shall assure that each contract employee is trained in the work practices necessary to safely perform his/her job.

(b) The contract employer shall assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan.

(c) The contract employer shall document that each contract employee has received and understood the training required by this paragraph. The contract employer shall prepare a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

(d) The contract employer shall assure that each contract employee follows the safety rules of the facility including the safe work practices required by WAC 296-67-021.

(e) The contract employer shall advise the employer of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-029, filed 8/10/92, effective 9/10/92.]

WAC 296-67-033 Prestartup safety review. (1) The employer shall perform a prestartup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information.

(2) The prestartup safety review shall confirm that prior to the introduction of highly hazardous chemicals to a process:

(a) Construction and equipment is in accordance with design specifications;

(b) Safety, operating, maintenance, and emergency procedures are in place and are adequate;

(c) For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in management of change, WAC 296-67-045.

(d) Training of each employee involved in operating a process has been completed.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-033, filed 8/10/92, effective 9/10/92.]

WAC 296-67-037 Mechanical integrity. (1) Application. WAC 296-67-037 (2) through (6) apply to the following process equipment:

- (a) Pressure vessels and storage tanks;
- (b) Piping systems (including piping components such as valves);
- (c) Relief and vent systems and devices;
- (d) Emergency shutdown systems;
- (e) Controls (including monitoring devices and sensors, alarms, and interlocks); and
- (f) Pumps.

(2) Written procedures. The employer shall establish and implement written procedures to maintain the ongoing integrity of process equipment.

(3) Training for process maintenance activities. The employer shall train each employee involved in maintaining the ongoing integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.

(4) Inspection and testing.

(a) Inspections and tests shall be performed on process equipment.

(b) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.

(c) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.

(d) The employer shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

(5) Equipment deficiencies. The employer shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in WAC 296-67-013) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

(6) Quality assurance.

(a) In the construction of new plants and equipment, the employer shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.

(b) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.

(c) The employer shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-037, filed 8/10/92, effective 9/10/92.]

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WAC 296-67-041 Hot work permit. (1) The employer shall issue a hot work permit for hot work operations conducted on or near a covered process.

(2) The permit shall document that the fire prevention and protection requirements in WAC 296-24-695 have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed.

(3) The permit shall be kept on file until completion of the hot work operations.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-041, filed 8/10/92, effective 9/10/92.]

WAC 296-67-045 Management of change. (1) The employer shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.

(2) The procedures shall assure that the following considerations are addressed prior to any change:

- (a) The technical basis for the proposed change;
- (b) Impact of change on safety and health;
- (c) Modifications to operating procedures;
- (d) Necessary time period for the change; and
- (e) Authorization requirements for the proposed change.

(3) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.

(4) If a change covered by this section results in a change in the process safety information required by WAC 296-67-013, such information shall be updated accordingly.

(5) If a change covered by this section results in a change in the operating procedures or practices required by WAC 296-67-021, such procedures or practices shall be updated accordingly.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-045, filed 8/10/92, effective 9/10/92.]

WAC 296-67-049 Incident investigation. (1) The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace.

(2) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(3) An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.

(4) A report shall be prepared at the conclusion of the investigation which includes at a minimum:

- (a) Date of incident;
- (b) Date investigation began;
- (c) A description of the incident;
- (d) The factors that contributed to the incident; and

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(e) Any recommendations resulting from the investigation.

(5) The employer shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.

(6) The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.

(7) Incident investigation reports shall be retained for five years.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-049, filed 8/10/92, effective 9/10/92.]

WAC 296-67-053 Emergency planning and response.

The employer shall establish and implement an emergency action plan for the entire plant in accordance with the provisions of WAC 296-24-567. In addition, the emergency action plan shall include procedures for handling small releases. Employers covered under this standard may also be subject to the hazardous waste and emergency response provisions contained in chapter 296-62 WAC, Part P.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-053, filed 8/10/92, effective 9/10/92.]

WAC 296-67-057 Compliance audits. (1) Employers shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.

(2) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(3) A report of the findings of the audit shall be developed.

(4) The employer shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.

(5) Employers shall retain the two most recent compliance audit reports.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-057, filed 8/10/92, effective 9/10/92.]

WAC 296-67-061 Trade secrets. (1) Employers shall make all information necessary to comply with the section available to those persons responsible for compiling the process safety information (required by WAC 296-67-013), those assisting in the development of the process hazard analysis (required by WAC 296-67-017), those responsible for developing the operating procedures (required by WAC 296-67-021), and those involved in incident investigations (required by WAC 296-67-049), emergency planning and response (WAC 296-67-053) and compliance audits (WAC 296-67-057) without regard to possible trade secret status of such information.

(2) Nothing in this section shall preclude the employer from requiring the persons to whom the information is made available under WAC 296-67-061 to enter into confidentiality agreements not to disclose the information as set forth in WAC 296-62-054.

(3) Subject to the rules and procedures set forth in WAC 296-62-05417 (1) through (14), employees and their designated representatives shall have access to trade secret information contained within the process hazard analysis and other documents required to be developed by this standard.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-061, filed 8/10/92, effective 9/10/92.]

WAC 296-67-285 Appendix A—List of highly hazardous chemicals, toxics and reactives (mandatory). This appendix contains a listing of toxic and reactive highly hazardous chemicals which present a potential for a catastrophic event at or above the threshold quantity.

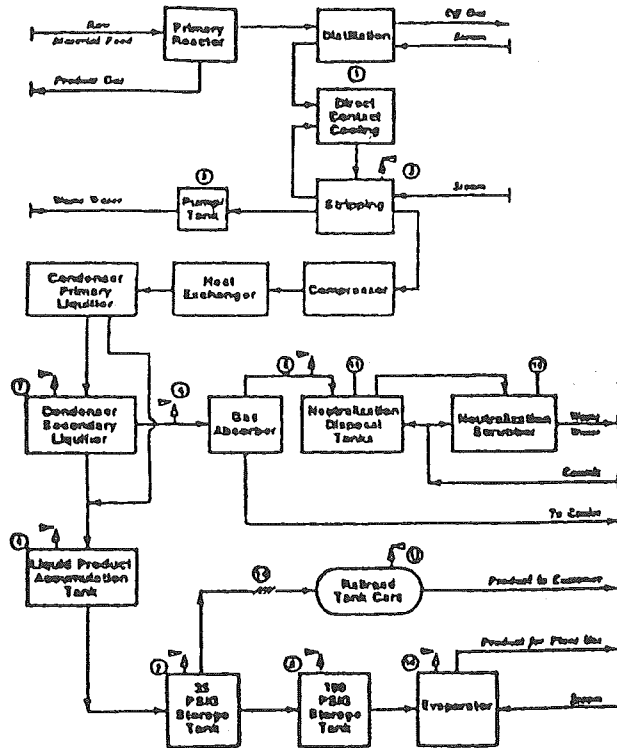
CHEMICAL NAME	CAS*	TQ**
Acetaldehyde	75-07-0	2500
Acrolein (2-Propenal)	107-02-8	150
Acrylyl Chloride	814-68-6	250
Allyl Chloride	107-05-1	1000
Allylamine	107-11-9	1000
Alkylaluminums	Varies	5000
Ammonia, Anhydrous	7664-41-7	10000
Ammonia solutions (>44% ammonia by weight)	7664-41-7	15000
Ammonium Perchlorate	7790-98-9	7500
Ammonium Permanganate	7787-36-2	7500
Arsine (also called Arsenic Hydride)	7784-42-1	100
Bis(Chloromethyl) Ether	542-88-1	100
Boron Trichloride	10294-34-5	2500
Boron Trifluoride	7637-07-2	250
Bromine	7726-95-6	1500
Bromine Chloride	13863-41-7	1500
Bromine Pentafluoride	7789-30-2	2500
Bromine Trifluoride	7787-71-5	15000
3-Bromopropyne (also called Propargyl Bromide)	106-96-7	100
Butyl Hydroperoxide (Tertiary)	75-91-2	5000
Butyl Perbenzoate (Tertiary)	614-45-9	7500
Carbonyl Chloride (see Phosgene)	75-44-5	100
Carbonyl Fluoride	353-50-4	2500
Cellulose Nitrate (concentration >12.6% nitrogen)	9004-70-0	2500
Chlorine	7782-50-5	1500
Chlorine Dioxide	10049-04-4	1000
Chlorine Pentafluoride	13637-63-3	1000
Chlorine Trifluoride	7790-91-2	1000
Chlorodiethylaluminum (also called Diethylaluminum Chloride)	96-10-6	5000
1-Chloro-2,4-Dinitrobenzene	97-00-7	5000
Chloromethyl Methyl Ether	107-30-2	500
Chloropicrin	76-06-2	500
Chloropicrin and Methyl Bromide mixture	None	1500
Chloropicrin and Methyl Chloride mixture	None	1500
Cumene Hydroperoxide	80-15-9	5000
Cyanogen	460-19-5	2500
Cyanogen Chloride	506-77-4	500
Cyanuric Fluoride	675-14-9	100
Diacetyl Peroxide (Concentration >70%)	110-22-5	5000
Diazomethane	334-88-3	500
Dibenzoyl Peroxide	94-36-0	7500
Diborane	19287-45-7	100
Dibutyl Peroxide (Tertiary)	110-05-4	5000
Dichloro Acetylene	7572-29-4	250
Dichlorosilane	4109-96-0	2500
Diethylzinc	557-20-0	10000
Diisopropyl Peroxydicarbonate	105-64-6	7500
Dilaluroyl Peroxide	105-74-8	7500
Dimethyldichlorosilane	75-78-5	1000
Dimethylhydrazine, 1,1-	57-14-7	1000
Dimethylamine, Anhydrous	124-40-3	2500
2,4-Dinitroaniline	97-02-9	5000

CHEMICAL NAME	CAS*	TQ**	CHEMICAL NAME	CAS*	TQ**
Ethyl Methyl Ketone Peroxide (also Methyl Ethyl Ketone Peroxide; concentration >60%)	1338-23-4	5000	Phosphoryl Chloride (also called Phosphorus Oxychloride)	10025-87-3	1000
Ethyl Nitrite	109-95-5	5000	Propargyl Bromide	106-96-7	100
Ethylamine	75-04-7	7500	Propyl Nitrate	627-3-4	2500
Ethylene Fluorohydrin	371-62-0	100	Sarin	107-44-8	100
Ethylene Oxide	75-21-8	5000	Selenium Hexafluoride	7783-79-1	1000
Ethyleneimine	151-56-4	1000	Stibine (Antimony Hydride)	7803-52-3	500
Fluorine	7782-41-4	1000	Sulfur Dioxide (liquid)	7446-09-5	1000
Formaldehyde (Formalin)	50-00-0	1000	Sulfur Pentafluoride	5714-22-7	250
Furan	110-00-9	500	Sulfur Tetrafluoride	7783-60-0	250
Hexafluoroacetone	684-16-2	5000	Sulfur Trioxide (also called Sulfuric Anhydride)	7446-11-9	1000
Hydrochloric Acid, Anhydrous	7647-01-0	5000	Sulfuric Anhydride (also called Sulfur Trioxide)	7446-11-9	1000
Hydrofluoric Acid, Anhydrous	7664-39-3	1000	Tellurium Hexafluoride	7783-80-4	250
Hydrogen Bromide	10035-10-6	5000	Tetrafluoroethylene	116-14-3	5000
Hydrogen Chloride	7647-01-0	5000	Tetrafluorohydrazine	10036-47-2	5000
Hydrogen Cyanide, Anhydrous	74-90-8	1000	Tetramethyl Lead	75-74-1	1000
Hydrogen Fluoride	7664-39-3	1000	Thionyl Chloride	7719-09-7	250
Hydrogen Peroxide (52% by weight or greater)	7722-84-1	7500	Trichloro (chloromethyl) Silane	1558-25-4	100
Hydrogen Selenide	7783-07-5	150	Trichloro (dichlorophenyl) Silane	27137-85-5	2500
Hydrogen Sulfide	7783-06-4	1500	Trichlorosilane	10025-78-2	5000
Hydroxylamine	7803-49-8	2500	Trifluorochloroethylene	79-38-9	10000
Iron, Pentacarbonyl	13463-40-6	250	Trimethoxysilane	2487-90-3	1500
Isopropylamine	75-31-0	5000			
Ketene	463-51-4	100	* Chemical Abstract Service Number.		
Methacrylaldehyde	78-85-3	1000	** Threshold Quantity in Pounds (Amount necessary to be covered by this standard).		
Methacryloyl Chloride	920-46-7	150			
Methacryloyloxyethyl Isocyanate	30674-80-7	100			
Methyl Acrylonitrile	126-98-7	250			
Methylamine, Anhydrous	74-89-5	1000			
Methyl Bromide	74-83-9	2500			
Methyl Chloride	74-87-3	15000			
Methyl Chloroformate	79-22-1	500			
Methyl Ethyl Ketone Peroxide (concentration >60%)	1338-23-4	5000			
Methyl Fluoroacetate	453-18-9	100			
Methyl Fluorosulfate	421-20-5	100			
Methyl Hydrazine	60-34-4	100			
Methyl Iodide	74-88-4	7500			
Methyl Isocyanate	624-83-9	250			
Methyl Mercaptan	74-93-1	5000			
Methyl Vinyl Ketone	79-84-4	100			
Methyltrichlorosilane	75-79-6	500			
Nickel Carbonyl (Nickel Tetracarbonyl)	13463-39-3	150			
Nitric Acid (94.5% by weight or greater)	7697-37-2	500			
Nitric Oxide	10102-43-9	250			
Nitroaniline (para Nitroaniline)	100-01-6	5000			
Nitromethane	75-52-5	2500			
Nitrogen Dioxide	10102-44-0	250			
Nitrogen Oxides (NO; NO ₂ ; N ₂ O ₄ ; N ₂ O ₃)	10102-44-0	250			
Nitrogen Tetroxide (also called Nitrogen Peroxide)	10544-72-6	250			
Nitrogen Trifluoride	7783-54-2	5000			
Nitrogen Trioxide	10544-73-7	250			
Oleum (65% to 80% by weight; also called Fuming Sulfuric Acid)	8014-94-7	1000			
Osmium Tetroxide	20816-12-0	100			
Oxygen Difluoride (Fluorine Monoxide)	7783-41-7	100			
Ozone	10028-15-6	100			
Pentaborane	19624-22-7	100			
Peracetic Acid (concentration >60% Acetic Acid; also called Peroxyacetic Acid)	79-21-0	1000			
Perchloric Acid (concentration >60% by weight)	7601-90-3	5000			
Perchloromethyl Mercaptan	594-42-3	150			
Perchloryl Fluoride	7616-94-6	5000			
Peroxyacetic Acid (concentration >60% Acetic Acid; also called Peracetic Acid)	79-21-0	1000			
Phosgene (also called Carbonyl Chloride)	75-44-5	100			
Phosphine (Hydrogen Phosphide)	7803-51-2	100			
Phosphorus Oxychloride (also called Phosphoryl Chloride)	10025-87-3	1000			
Phosphorus Trichloride	7719-12-2	1000			

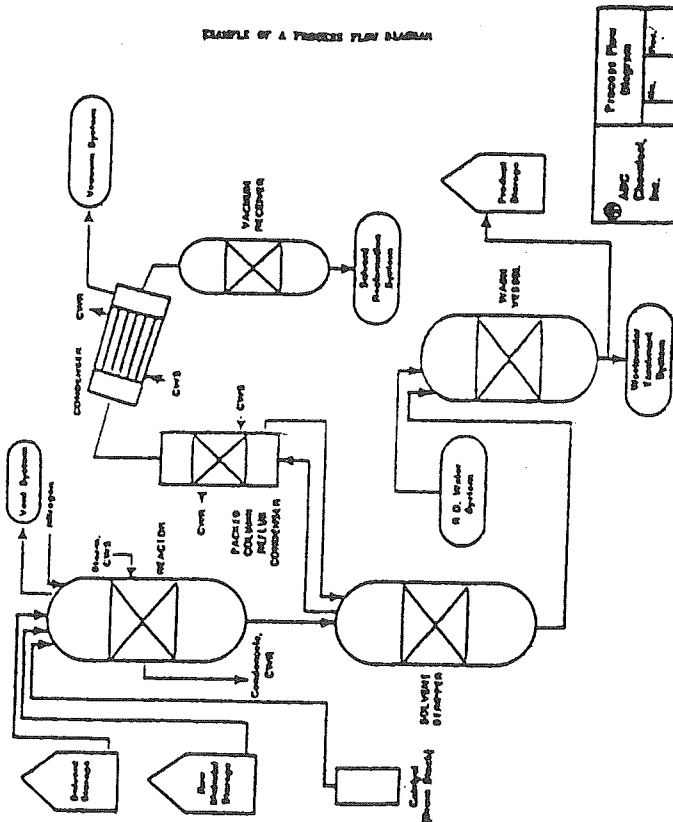
[Statutory Authority: Chapter 49.17 RCW. 93-21-075 (Order 93-06), § 296-67-285, filed 10/20/93, effective 12/1/93; 92-17-022 (Order 92-06), § 296-67-285, filed 8/10/92, effective 9/10/92.]

WAC 296-67-289 Appendix B—Block flow diagram and simplified process flow diagram (nonmandatory).

EXAMPLE OF A BLOCK FLOW DIAGRAM



EXAMPLE OF A PROCESS FLOW DIAGRAM



[Statutory Authority: Chapter 49.17 RCW, 92-17-022 (Order 92-06), § 296-67-289, filed 8/10/92, effective 9/10/92.]

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WAC 296-67-291 Appendix C—Compliance guidelines and recommendations for process safety management (nonmandatory). This appendix serves as a nonmandatory guideline to assist employers and employees in complying with the requirements of this section, as well as provides other helpful recommendations and information. Examples presented in this appendix are not the only means of achieving the performance goals in the standard. This appendix neither adds nor detracts from the requirements of the standard.

(1) Introduction to process safety management. The major objective of process safety management of highly hazardous chemicals is to prevent unwanted releases of hazardous chemicals especially into locations which could expose employees and others to serious hazards. An effective process safety management program requires a systematic approach to evaluating the whole process. Using this approach the process design, process technology, operational and maintenance activities and procedures, nonroutine activities and procedures, emergency preparedness plans and procedures, training programs, and other elements which impact the process are all considered in the evaluation. The various lines of defense that have been incorporated into the design and operation of the process to prevent or mitigate the release of hazardous chemicals need to be evaluated and strengthened to assure their effectiveness at each level. Process safety management is the proactive identification, evaluation and mitigation or prevention of chemical releases that could occur as a result of failures in process, procedures, or equipment. The process safety management standard targets highly hazardous chemicals that have the potential to cause a catastrophic incident. This standard as a whole is to aid employers in their efforts to prevent or mitigate episodic chemical releases that could lead to a catastrophe in the workplace and possibly to the surrounding community. To control these types of hazards, employers need to develop the necessary expertise, experiences, judgment, and proactive initiative within their workforce to properly implement and maintain an effective process safety management program as envisioned in the WISHA standard. This WISHA standard is required by the Clean Air Act amendments as is the Environmental Protection Agency's Risk Management Plan. Employers, who merge the two sets of requirements into their process safety management program, will better assure full compliance with each as well as enhancing their relationship with the local community. While WISHA believes process safety management will have a positive effect on the safety of employees in workplaces and also offers other potential benefits to employers (increased productivity), smaller businesses which may have limited resources available to them at this time, might consider alternative avenues of decreasing the risks associated with highly hazardous chemicals at their workplaces. One method which might be considered is the reduction in the inventory of the highly hazardous chemical. This reduction in inventory will result in a reduction of the risk or potential for a catastrophic incident. Also, employers including small employers may be able to establish more efficient inventory control by reducing the quantities of highly hazardous chemicals on site below the established threshold quantities. This reduction can be accomplished by ordering

smaller shipments and maintaining the minimum inventory necessary for efficient and safe operation. When reduced inventory is not feasible, then the employer might consider dispersing inventory to several locations on site. Dispersing storage into locations where a release in one location will not cause a release in another location is a practical method to also reduce the risk or potential for catastrophic incidents.

(2) Employee involvement in process safety management. Section 304 of the Clean Air Act amendments states that employers are to consult with their employees and their representatives regarding the employers efforts in the development and implementation of the process safety management program elements and hazard assessments. Section 304 also requires employers to train and educate their employees and to inform affected employees of the findings from incident investigations required by the process safety management program. Many employers, under their safety and health programs, have already established means and methods to keep employees and their representatives informed about relevant safety and health issues and employers may be able to adapt these practices and procedures to meet their obligations under this standard. Employers who have not implemented an occupational safety and health program may wish to form a safety and health committee of employees and management representatives to help the employer meet the obligations specified by this standard. These committees can become a significant ally in helping the employer to implement and maintain an effective process safety management program for all employees.

(3) Process safety information. Complete and accurate written information concerning process chemicals, process technology, and process equipment is essential to an effective process safety management program and to a process hazards analysis. The compiled information will be a necessary resource to a variety of users including the team that will perform the process hazards analysis as required under WAC 296-67-017; those developing the training programs and the operating procedures; contractors whose employees will be working with the process; those conducting the prestart-up reviews; local emergency preparedness planners; and incurrence and enforcement officials. The information to be compiled about the chemicals, including process intermediates, needs to be comprehensive enough for an accurate assessment of the fire and explosion characteristics, reactivity hazards, the safety and health hazards to workers, and the corrosion and erosion effects on the process equipment and monitoring tools. Current material safety data sheet (MSDS) information can be used to help meet this requirement which must be supplemented with process chemistry information including runaway reaction and over pressure hazards if applicable. Process technology information will be a part of the process safety information package and it is expected that it will include diagrams of the type shown in WAC 296-67-289, Appendix B of this part as well as employer established criteria for maximum inventory levels for process chemicals; limits beyond which would be considered upset conditions; and a qualitative estimate of the consequences or results of deviation that could occur if operating beyond the established process limits. Employers are encouraged to use diagrams which will help users understand the process. A block flow

diagram is used to show the major process equipment and interconnecting process flow lines and show flow rates, stream composition, temperatures, and pressures when necessary for clarity. The block flow diagram is a simplified diagram. Process flow diagrams are more complex and will show all main flow streams including valves to enhance the understanding of the process, as well as pressures and temperatures on all feed and product lines within all major vessels, in and out of headers and heat exchangers, and points of pressure and temperature control. Also, materials of construction information, pump capacities and pressure heads, compressor horsepower and vessel design pressures and temperatures are shown when necessary for clarity. In addition, major components of control loops are usually shown along with key utilities on process flow diagrams. Piping and instrument diagrams (P&IDs) may be the more appropriate type of diagrams to show some of the above details and to display the information for the piping designer and engineering staff. The P&IDs are to be used to describe the relationships between equipment and instrumentation as well as other relevant information that will enhance clarity. Computer software programs which do P&IDs or other diagrams useful to the information package, may be used to help meet this requirement. The information pertaining to process equipment design must be documented. In other words, what were the codes and standards relied on to establish good engineering practice. These codes and standards are published by such organizations as the American Society of Mechanical Engineers, American Petroleum Institute, American National Standards Institute, National Fire Protection Association, American Society for Testing and Materials, National Board of Boiler and Pressure Vessel Inspectors, National Association of Corrosion Engineers, American Society of Exchange Manufacturers Association, and model building code groups. In addition, various engineering societies issue technical reports which impact process design. For example, the American Institute of Chemical Engineers has published technical reports on topics such as two phase flow for venting devices. This type of technically recognized report would constitute good engineering practice. For existing equipment designed and constructed many years ago in accordance with the codes and standards available at that time and no longer in general use today, the employer must document which codes and standards were used and that the design and construction along with the testing, inspection and operation are still suitable for the intended use. Where the process technology requires a design which departs from the applicable codes and standards, the employer must document that the design and construction is suitable for the intended purpose.

(4) Process hazard analysis. A process hazard analysis (PHA), sometimes called a process hazard evaluation, is one of the most important elements of the process safety management program. A PHA is an organized and systematic effort to identify and analyze the significance of potential hazards associated with the processing or handling of highly hazardous chemicals. A PHA provides information which will assist employers and employees in making decisions for improving safety and reducing the consequences of unwanted or unplanned releases of hazardous chemicals. A PHA is directed toward analyzing potential causes and consequences

of fires, explosions, releases of toxic or flammable chemicals and major spills of hazardous chemicals. The PHA focuses on equipment, instrumentation, utilities, human actions (routine and nonroutine), and external factors that might impact the process. These considerations assist in determining the hazards and potential failure points or failure modes in a process. The selection of a PHA methodology or technique will be influenced by many factors including the amount of existing knowledge about the process. Is it a process that has been operated for a long period of time with little or no innovation and extensive experience has been generated with its use? Or, is it a new process or one which has been changed frequently by the inclusion of innovative features? Also, the size and complexity of the process will influence the decision as to the appropriate PHA methodology to use. All PHA methodologies are subject to certain limitations. For example, the checklist methodology works well when the process is very stable and no changes are made, but it is not as effective when the process has undergone extensive change. The checklist may miss the most recent changes and consequently the changes would not be evaluated. Another limitation to be considered concerns the assumptions made by the team or analyst. The PHA is dependent on good judgment and the assumptions made during the study need to be documented and understood by the team and reviewer and kept for a future PHA. The team conducting the PHA need to understand the methodology that is going to be used. A PHA team can vary in size from two people to a number of people with varied operational and technical backgrounds. Some team members may only be a part of the team for a limited time. The team leader needs to be fully knowledgeable in the proper implementation of the PHA methodology that is to be used and should be impartial in the evaluation. The other full or part time team members need to provide the team with expertise in areas such as process technology, process design, operating procedures and practices, including how the work is actually performed, alarms, emergency procedures, instrumentation, maintenance procedures, both routine and non-routine tasks, including how the tasks are authorized, procurement of parts and supplies, safety and health, and any other relevant subject as the need dictates. At least one team member must be familiar with the process. The ideal team will have an intimate knowledge of the standards, codes, specifications and regulations applicable to the process being studied. The selected team members need to be compatible and the team leader needs to be able to manage the team, and the PHA study. The team needs to be able to work together while benefiting from the expertise of others on the team or outside the team, to resolve issues, and to forge a consensus on the findings of the study and recommendations. The application of a PHA to a process may involve the use of different methodologies for various parts of the process. For example, a process involving a series of unit operations of varying sizes, complexities, and ages may use different methodologies and team members for each operation. Then the conclusions can be integrated into one final study and evaluation. A more specific example is the use of a checklist PHA for a standard boiler or heat exchanger and the use of a hazard and operability PHA for the overall process. Also, for batch type processes like custom batch operations, a generic PHA of a

representative batch may be used where there are only small changes of monomer or other ingredient ratios and the chemistry is documented for the full range and ratio of batch ingredients. Another process that might consider using a generic type of PHA is a gas plant. Often these plants are simply moved from site to site and therefore, a generic PHA may be used for these movable plants. Also, when an employer has several similar size gas plants and no sour gas is being processed at the site, then a generic PHA is feasible as long as the variations of the individual sites are accounted for in the PHA. Finally, when an employer has a large continuous process which has several control rooms for different portions of the process such as for a distillation tower and a blending operation, the employer may wish to do each segment separately and then integrate the final results. Additionally, small businesses which are covered by this rule, will often have processes that have less storage volume, less capacity, and less complicated than processes at a large facility. Therefore, WISHA would anticipate that the less complex methodologies would be used to meet the process hazard analysis criteria in the standard. These process hazard analyses can be done in less time and with a few people being involved. A less complex process generally means that less data, P&IDs, and process information is needed to perform a process hazard analysis. Many small businesses have processes that are not unique, such as cold storage lockers or water treatment facilities. Where employer associations have a number of members with such facilities, a generic PHA, evolved from a checklist or what-if questions, could be developed and used by each employer effectively to reflect his/her particular process; this would simplify compliance for them. When the employer has a number of processes which require a PHA, the employer must set up a priority system of which PHAs to conduct first. A preliminary or gross hazard analysis may be useful in prioritizing the processes that the employer has determined are subject to coverage by the process safety management standard. Consideration should first be given to those processes with the potential of adversely affecting the largest number of employees. This prioritizing should consider the potential severity of a chemical release, the number of potentially affected employees, the operating history of the process such as the frequency of chemical releases, the age of the process and any other relevant factors. These factors would suggest a ranking order and would suggest either using a weighing factor system or a systematic ranking method. The use of a preliminary hazard analysis would assist an employer in determining which process should be of the highest priority and thereby the employer would obtain the greatest improvement in safety at the facility. Detailed guidance on the content and application of process hazard analysis methodologies is available from the American Institute of Chemical Engineers' Center for Chemical Process Safety (see WAC 296-67-293, Appendix D).

(5) Operating procedures and practices. Operating procedures describe tasks to be performed, data to be recorded, operating conditions to be maintained, samples to be collected, and safety and health precautions to be taken. The procedures need to be technically accurate, understandable to employees, and revised periodically to ensure that they reflect current operations. The process safety information

package is to be used as a resource to better assure that the operating procedures and practices are consistent with the known hazards of the chemicals in the process and that the operating parameters are accurate. Operating procedures should be reviewed by engineering staff and operating personnel to ensure that they are accurate and provide practical instructions on how to actually carry out job duties safely. Operating procedures will include specific instructions or details on what steps are to be taken or followed in carrying out the stated procedures. These operating instructions for each procedure should include the applicable safety precautions and should contain appropriate information on safety implications. For example, the operating procedures addressing operating parameters will contain operating instructions about pressure limits, temperature ranges, flow rates, what to do when an upset condition occurs, what alarms and instruments are pertinent if an upset condition occurs, and other subjects. Another example of using operating instructions to properly implement operating procedures is in starting up or shutting down the process. In these cases, different parameters will be required from those of normal operation. These operating instructions need to clearly indicate the distinctions between startup and normal operations such as the appropriate allowances for heating up a unit to reach the normal operating parameters. Also the operating instructions need to describe the proper method for increasing the temperature of the unit until the normal operating temperature parameters are achieved. Computerized process control systems add complexity to operating instructions. These operating instructions need to describe the logic of the software as well as the relationship between the equipment and the control system; otherwise, it may not be apparent to the operator. Operating procedures and instructions are important for training operating personnel. The operating procedures are often viewed as the standard operating practices (SOPs) for operations. Control room personnel and operating staff, in general, need to have a full understanding of operating procedures. If workers are not fluent in English then procedures and instructions need to be prepared in a second language understood by the workers. In addition, operating procedures need to be changed when there is a change in the process as a result of the management of change procedures. The consequences of operating procedure changes need to be fully evaluated and the information conveyed to the personnel. For example, mechanical changes to the process made by the maintenance department (like changing a valve from steel to brass or other subtle changes) need to be evaluated to determine if operating procedures and practices also need to be changed. All management of change actions must be coordinated and integrated with current operating procedures and operating personnel must be oriented to the changes in procedures before the change is made. When the process is shut down in order to make a change, then the operating procedures must be updated before startup of the process. Training in how to handle upset conditions must be accomplished as well as what operating personnel are to do in emergencies such as when a pump seal fails or a pipeline ruptures. Communication between operating personnel and workers performing work within the process area, such as nonroutine tasks, also must be maintained. The hazards of the tasks are to be conveyed to

operating personnel in accordance with established procedures and to those performing the actual tasks. When the work is completed, operating personnel should be informed to provide closure on the job.

(6) Employee training. All employees, including maintenance and contractor employees, involved with highly hazardous chemicals need to fully understand the safety and health hazards of the chemicals and processes they work with for the protection of themselves, their fellow employees and the citizens of nearby communities. Training conducted in compliance with WAC 296-62-054, the hazard communication standard, will help employees to be more knowledgeable about the chemicals they work with as well as familiarize them with reading and understanding MSDS. However, additional training in subjects such as operating procedures and safety work practices, emergency evacuation and response, safety procedures, routine and nonroutine work authorization activities, and other areas pertinent to process safety and health will need to be covered by an employer's training program. In establishing their training programs, employers must clearly define the employees to be trained and what subjects are to be covered in their training. Employers in setting up their training program will need to clearly establish the goals and objectives they wish to achieve with the training that they provide to their employees. The learning goals or objectives should be written in clear measurable terms before the training begins. These goals and objectives need to be tailored to each of the specific training modules or segments. Employers should describe the important actions and conditions under which the employee will demonstrate competence or knowledge as well as what is acceptable performance. Hands-on-training where employees are able to use their senses beyond listening, will enhance learning. For example, operating personnel, who will work in a control room or at control panels, would benefit by being trained at a simulated control panel or panels. Upset conditions of various types could be displayed on the simulator, and then the employee could go through the proper operating procedures to bring the simulator panel back to the normal operating parameters. A training environment could be created to help the trainee feel the full reality of the situation but, of course, under controlled conditions. This realistic type of training can be very effective in teaching employees correct procedures while allowing them to also see the consequences of what might happen if they do not follow established operating procedures. Other training techniques using videos or on-the-job training can also be very effective for teaching other job tasks, duties, or other important information. An effective training program will allow the employee to fully participate in the training process and to practice their skill or knowledge. Employers need to periodically evaluate their training programs to see if the necessary skills, knowledge, and routines are being properly understood and implemented by their trained employees. The means or methods for evaluating the training should be developed along with the training program goals and objectives. Training program evaluation will help employers to determine the amount of training their employees understood, and whether the desired results were obtained. If, after the evaluation, it appears that the trained employees are not at the level of knowledge and skill that was

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expected, the employer will need to revise the training program, provide retraining, or provide more frequent refresher training sessions until the deficiency is resolved. Those who conducted the training and those who received the training should also be consulted as to how best to improve the training process. If there is a language barrier, the language known to the trainees should be used to reinforce the training messages and information. Careful consideration must be given to assure that employees including maintenance and contract employees receive current and updated training. For example, if changes are made to a process, impacted employees must be trained in the changes and understand the effects of the changes on their job tasks (e.g., any new operating procedures pertinent to their tasks). Additionally, as already discussed the evaluation of the employee's absorption of training will certainly influence the need for training.

(7) Contractors. Employers who use contractors to perform work in and around processes that involve highly hazardous chemicals, will need to establish a screening process so that they hire and use contractors who accomplish the desired job tasks without compromising the safety and health of employees at a facility. For contractors, whose safety performance on the job is not known to the hiring employer, the employer will need to obtain information on injury and illness rates and experience and should obtain contractor references. Additionally, the employer must assure that the contractor has the appropriate job skills, knowledge and certifications (such as for pressure vessel welders). Contractor work methods and experiences should be evaluated. For example, does the contractor conducting demolition work swing loads over operating processes or does the contractor avoid such hazards? Maintaining a site injury and illness log for contractors is another method employers must use to track and maintain current knowledge of work activities involving contract employees working on or adjacent to covered processes. Injury and illness logs of both the employer's employees and contract employees allow an employer to have full knowledge of process injury and illness experience. This log will also contain information which will be of use to those auditing process safety management compliance and those involved in incident investigations. Contract employees must perform their work safely. Considering that contractors often perform very specialized and potentially hazardous tasks such as confined space entry activities and nonroutine repair activities it is quite important that their activities be controlled while they are working on or near a covered process. A permit system or work authorization system for these activities would also be helpful to all affected employers. The use of a work authorization system keeps an employer informed of contract employee activities, and as a benefit the employer will have better coordination and more management control over the work being performed in the process area. A well run and well maintained process where employee safety is fully recognized will benefit all of those who work in the facility whether they be contract employees or employees of the owner.

(8) Prestartup safety. For new processes, the employer will find a PHA helpful in improving the design and construction of the process from a reliability and quality point of view. The safe operation of the new process will be enhanced

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by making use of the PHA recommendations before final installations are completed. P&IDs are to be completed along with having the operating procedures in place and the operating staff trained to run the process before startup. The initial startup procedures and normal operating procedures need to be fully evaluated as part of the prestartup review to assure a safe transfer into the normal operating mode for meeting the process parameters. For existing processes that have been shutdown for turnaround, or modification, etc., the employer must assure that any changes other than "replacement in kind" made to the process during shutdown go through the management of change procedures. P&IDs will need to be updated as necessary, as well as operating procedures and instructions. If the changes made to the process during shutdown are significant and impact the training program, then operating personnel as well as employees engaged in routine and nonroutine work in the process area may need some refresher or additional training in light of the changes. Any incident investigation recommendations, compliance audits or PHA recommendations need to be reviewed as well to see what impacts they may have on the process before beginning the startup.

(9) Mechanical integrity. Employers will need to review their maintenance programs and schedules to see if there are areas where "breakdown" maintenance is used rather than an ongoing mechanical integrity program. Equipment used to process, store, or handle highly hazardous chemicals needs to be designed, constructed, installed, and maintained to minimize the risk of releases of such chemicals. This requires that a mechanical integrity program be in place to assure the continued integrity of process equipment. Elements of a mechanical integrity program include the identification and categorization of equipment and instrumentation, inspections and tests, testing and inspection frequencies, development of maintenance procedures, training of maintenance personnel, the establishment of criteria for acceptable test results, documentation of test and inspection results, and documentation of manufacturer recommendations as to meantime to failure for equipment and instrumentation. The first line of defense an employer has available is to operate and maintain the process as designed, and to keep the chemicals contained. This line of defense is backed up by the next line of defense which is the controlled release of chemicals through venting to scrubbers or flares, or to surge or overflow tanks which are designed to receive such chemicals, etc. These lines of defense are the primary lines of defense or means to prevent unwanted releases. The secondary lines of defense would include fixed fire protection systems like sprinklers, water spray, or deluge systems, monitor guns, etc., dikes, designed drainage systems, and other systems which would control or mitigate hazardous chemicals once an unwanted release occurs. These primary and secondary lines of defense are what the mechanical integrity program needs to protect and strengthen these primary and secondary lines of defenses where appropriate. The first step of an effective mechanical integrity program is to compile and categorize a list of process equipment and instrumentation for inclusion in the program. This list would include pressure vessels, storage tanks, process piping, relief and vent systems, fire protection system components, emergency shutdown systems, and alarms and

interlocks and pumps. For the categorization of instrumentation and the listed equipment the employer would prioritize which pieces of equipment require closer scrutiny than others. Meantime to failure of various instrumentation and equipment parts would be known from the manufacturer's data or the employer's experience with the parts, which would then influence the inspection and testing frequency and associated procedures. Also, applicable codes and standards such as the National Board Inspection Code, or those from the American Society for Testing and Material, American Petroleum Institute, National Fire Protection Association, American National Standards Institute, American Society of Mechanical Engineers, and other groups, provide information to help establish an effective testing and inspection frequency, as well as appropriate methodologies. The applicable codes and standards provide criteria for external inspections for such items as foundation and supports, anchor bolts, concrete or steel supports, guy wires, nozzles and sprinklers, pipe hangers, grounding connections, protective coatings and insulation, and external metal surfaces of piping and vessels, etc. These codes and standards also provide information on methodologies for internal inspection, and a frequency formula based on the corrosion rate of the materials of construction. Also, erosion both internal and external needs to be considered along with corrosion effects for piping and valves. Where the corrosion rate is not known, a maximum inspection frequency is recommended, and methods of developing the corrosion rate are available in the codes. Internal inspections need to cover items such as vessel shell, bottom and head; metallic linings; nonmetallic linings; thickness measurements for vessels and piping; inspection for erosion, corrosion, cracking and bulges; internal equipment like trays, baffles, sensors, and screens for erosion, corrosion or cracking and other deficiencies. Some of these inspections may be performed by state or local government inspectors under state and local statutes. However, each employer needs to develop procedures to ensure that tests and inspections are conducted properly and that consistency is maintained even where different employees may be involved. Appropriate training is to be provided to maintenance personnel to ensure that they understand the preventive maintenance program procedures, safe practices, and the proper use and application of special equipment or unique tools that may be required. This training is part of the overall training program called for in the standard. A quality assurance system is needed to help ensure that the proper materials of construction are used, that fabrication and inspection procedures are proper, and that installation procedures recognize field installation concerns. The quality assurance program is an essential part of the mechanical integrity program and will help to maintain the primary and secondary lines of defense that have been designed into the process to prevent unwanted chemical releases or those which control or mitigate a release. "As built" drawings, together with certifications of coded vessels and other equipment, and materials of construction need to be verified and retained in the quality assurance documentation. Equipment installation jobs need to be properly inspected in the field for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job. The use of appropriate gaskets, packing, bolts, valves, lubricants, and welding

rods need to be verified in the field. Also procedures for installation of safety devices need to be verified, such as the torque on the bolts on ruptured disc installations, uniform torque on flange bolts, proper installation of pump seals, etc. If the quality of parts is a problem, it may be appropriate to conduct audits of the equipment supplier's facilities to better assure proper purchases of required equipment which is suitable for its intended service. Any changes in equipment that may become necessary will need to go through the management of change procedures.

(10) Nonroutine work authorizations. Nonroutine work which is conducted in process areas needs to be controlled by the employer in a consistent manner. The hazards identified involving the work that is to be accomplished must be communicated to those doing the work, but also to those operating personnel whose work could affect the safety of the process. A work authorization notice or permit must have a procedure that describes the steps the maintenance supervisor, contractor representative or other person needs to follow to obtain the necessary clearance to get the job started. The work authorization procedures need to reference and coordinate, as applicable, lockout/tagout procedures, line breaking procedures, confined space entry procedures and hot work authorizations. This procedure also needs to provide clear steps to follow once the job is completed in order to provide closure for those that need to know the job is now completed and equipment can be returned to normal.

(11) Managing change. To properly manage changes to process chemicals, technology, equipment and facilities, one must define what is meant by change. In this process safety management standard, change includes all modifications to equipment, procedures, raw materials and processing conditions other than "replacement in kind." These changes need to be properly managed by identifying and reviewing them prior to implementation of the change. For example, the operating procedures contain the operating parameters (pressure limits, temperature ranges, flow rates, etc.) and the importance of operating within these limits. While the operator must have the flexibility to maintain safe operation within the established parameters, any operation outside of these parameters requires review and approval by a written management of change procedure. Management of change covers such as changes in process technology and changes to equipment and instrumentation. Changes in process technology can result from changes in production rates, raw materials, experimentation, equipment unavailability, new equipment, new product development, change in catalyst and changes in operating conditions to improve yield or quality. Equipment changes include among others change in materials of construction, equipment specifications, piping rearrangements, experimental equipment, computer program revisions and changes in alarms and interlocks. Employers need to establish means and methods to detect both technical changes and mechanical changes. Temporary changes have caused a number of catastrophes over the years, and employers need to establish ways to detect temporary changes as well as those that are permanent. It is important that a time limit for temporary changes be established and monitored since, without control, these changes may tend to become permanent. Temporary changes are subject to the management of change provisions. In addition,

the management of change procedures are used to insure that the equipment and procedures are returned to their original or designed conditions at the end of the temporary change. Proper documentation and review of these changes is invaluable in assuring that the safety and health considerations are being incorporated into the operating procedures and the process. Employers may wish to develop a form or clearance sheet to facilitate the processing of changes through the management of change procedures. A typical change form may include a description and the purpose of the change, the technical basis for the change, safety and health considerations, documentation of changes for the operating procedures, maintenance procedures, inspection and testing, P&IDs, electrical classification, training and communications, prestartup inspection, duration if a temporary change, approvals and authorization. Where the impact of the change is minor and well understood, a check list reviewed by an authorized person with proper communication to others who are affected may be sufficient. However, for a more complex or significant design change, a hazard evaluation procedure with approvals by operations, maintenance, and safety departments may be appropriate. Changes in documents such as P&IDs, raw materials, operating procedures, mechanical integrity programs, electrical classifications, etc., need to be noted so that these revisions can be made permanent when the drawings and procedure manuals are updated. Copies of process changes need to be kept in an accessible location to ensure that design changes are available to operating personnel as well as to PHA team members when a PHA is being done or one is being updated.

(12) Investigation of incidents. Incident investigation is the process of identifying the underlying causes of incidents and implementing steps to prevent similar events from occurring. The intent of an incident investigation is for employers to learn from past experiences and thus avoid repeating past mistakes. The incidents for which WISHA expects employers to become aware and to investigate are the types of events which result in or could reasonably have resulted in a catastrophic release. Some of the events are sometimes referred to as "near misses," meaning that a serious consequence did not occur, but could have. Employers need to develop in-house capability to investigate incidents that occur in their facilities. A team needs to be assembled by the employer and trained in the techniques of investigation including how to conduct interviews of witnesses, needed documentation and report writing. A multidisciplinary team is better able to gather the facts of the event and to analyze them and develop plausible scenarios as to what happened, and why. Team members should be selected on the basis of their training, knowledge and ability to contribute to a team effort to fully investigate the incident. Employees in the process area where the incident occurred should be consulted, interviewed, or made a member of the team. Their knowledge of the events form a significant set of facts about the incident which occurred. The report, its findings and recommendations are to be shared with those who can benefit from the information. The cooperation of employees is essential to an effective incident investigation. The focus of the investigation should be to obtain facts, and not to place blame. The team and the

investigation process should clearly deal with all involved individuals in a fair, open, and consistent manner.

(13) Emergency preparedness. Each employer must address what actions employees are to take when there is an unwanted release of highly hazardous chemicals. Emergency preparedness or the employer's tertiary (third) lines of defense are those that will be relied on along with the secondary lines of defense when the primary lines of defense which are used to prevent an unwanted release fail to stop the release. Employers will need to decide if they want employees to handle and stop small or minor incidental releases. Whether they wish to mobilize the available resources at the plant and have them brought to bear on a more significant release. Or whether employers want their employees to evacuate the danger area and promptly escape to a preplanned safe zone area, and allow the local community emergency response organizations to handle the release. Or whether the employer wants to use some combination of these actions. Employers will need to select how many different emergency preparedness or tertiary lines of defense they plan to have and then develop the necessary plans and procedures, and appropriately train employees in their emergency duties and responsibilities and then implement these lines of defense. Employers at a minimum must have an emergency action plan which will facilitate the prompt evacuation of employees due to an unwanted release of a highly hazardous chemical. This means that the employer will have a plan that will be activated by an alarm system to alert employees when to evacuate and, that employees who are physically impaired, will have the necessary support and assistance to get them to the safe zone as well. The intent of these requirements is to alert and move employees to a safe zone quickly. Delaying alarms or confusing alarms are to be avoided. The use of process control centers or similar process buildings in the process area as safe areas is discouraged. Recent catastrophes have shown that a large life loss has occurred in these structures because of where they have been sited and because they are not necessarily designed to withstand over-pressures from shockwaves resulting from explosions in the process area. Unwanted incidental releases of highly hazardous chemicals in the process area must be addressed by the employer as to what actions employees are to take. If the employer wants employees to evacuate the area, then the emergency action plan will be activated. For outdoor processes where wind direction is important for selecting the safe route to a refuge area, the employer should place a wind direction indicator such as a wind sock or pennant at the highest point that can be seen throughout the process area. Employees can move in the direction of cross wind to upwind to gain safe access to the refuge area by knowing the wind direction. If the employer wants specific employees in the release area to control or stop the minor emergency or incidental release, these actions must be planned for in advance and procedures developed and implemented. Preplanning for handling incidental releases for minor emergencies in the process area needs to be done, appropriate equipment for the hazards must be provided, and training conducted for those employees who will perform the emergency work before they respond to handle an actual release. The employer's training program, including the hazard communication standard training is to address the train-

ing needs for employees who are expected to handle incidental or minor releases. Preplanning for releases that are more serious than incidental releases is another important line of defense to be used by the employer. When a serious release of a highly hazardous chemical occurs, the employer through preplanning will have determined in advance what actions employees are to take. The evacuation of the immediate release area and other areas as necessary would be accomplished under the emergency action plan. If the employer wishes to use plant personnel such as a fire brigade, spill control team, a hazardous materials team, or use employees to render aid to those in the immediate release area and control or mitigate the incident, these actions are covered by WAC 296-62-300, the hazardous waste operations and emergency response (HAZWOPER) standard. If outside assistance is necessary, such as through mutual aid agreements between employers or local government emergency response organizations, these emergency responders are also covered by HAZWOPER. The safety and health protections required for emergency responders are the responsibility of their employers and of the on-scene incident commander. Responders may be working under very hazardous conditions and therefore the objective is to have them competently led by an on-scene incident commander and the commander's staff, properly equipped to do their assigned work safely, and fully trained to carry out their duties safely before they respond to an emergency. Drills, training exercises, or simulations with the local community emergency response planners and responder organizations is one means to obtain better preparedness. This close cooperation and coordination between plant and local community emergency preparedness managers will also aid the employer in complying with the Environmental Protection Agency's risk management plan criteria. One effective way for medium to large facilities to enhance coordination and communication during emergencies for on plant operations and with local community organizations is for employers to establish and equip an emergency control center. The emergency control center would be sited in a safe zone area so that it could be occupied throughout the duration of an emergency. The center would serve as the major communication link between the on-scene incident commander and plant or corporate management as well as with the local community officials. The communication equipment in the emergency control center should include a network to receive and transmit information by telephone, radio, or other means. It is important to have a backup communication network in case of power failure or one communication means fails. The center should also be equipped with the plant layout and community maps, utility drawings including fire water, emergency lighting, appropriate reference materials such as a government agency notification list, company personnel phone list, SARA Title III reports and material safety data sheets, emergency plans and procedures manual, a listing with the location of emergency response equipment, mutual aid information, and access to meteorological or weather condition data and any dispersion modeling data.

(14) Compliance audits. Employers need to select a trained individual or assemble a trained team of people to audit the process safety management system and program. A small process or plant may need only one knowledgeable per-

son to conduct an audit. The audit is to include an evaluation of the design and effectiveness of the process safety management system and a field inspection of the safety and health conditions and practices to verify that the employer's systems are effectively implemented. The audit should be conducted or led by a person knowledgeable in audit techniques and who is impartial towards the facility or area being audited. The essential elements of an audit program include planning, staffing, conducting the audit, evaluation and corrective action, follow-up and documentation. Planning in advance is essential to the success of the auditing process. Each employer needs to establish the format, staffing, scheduling, and verification methods prior to conducting the audit. The format should be designed to provide the lead auditor with a procedure or checklist which details the requirements of each section of the standard. The names of the audit team members should be listed as part of the format as well. The checklist, if properly designed, could serve as the verification sheet which provides the auditor with the necessary information to expedite the review and assure that no requirements of the standard are omitted. This verification sheet format could also identify those elements that will require evaluation or a response to correct deficiencies. This sheet could also be used for developing the follow-up and documentation requirements. The selection of effective audit team members is critical to the success of the program. Team members should be chosen for their experience, knowledge, and training and should be familiar with the processes and with auditing techniques, practices, and procedures. The size of the team will vary depending on the size and complexity of the process under consideration. For a large, complex, highly instrumented plant, it may be desirable to have team members with expertise in process engineering and design, process chemistry, instrumentation and computer controls, electrical hazards and classifications, safety and health disciplines, maintenance, emergency preparedness, warehousing or shipping, and process safety auditing. The team may use part-time members to provide for the depth of expertise required as well as for what is actually done or followed, compared to what is written. An effective audit includes a review of the relevant documentation and process safety information, inspection of the physical facilities, and interviews with all levels of plant personnel. Utilizing the audit procedure and checklist developed in the preplanning stage, the audit team can systematically analyze compliance with the provisions of the standard and any other corporate policies that are relevant. For example, the audit team will review all aspects of the training program as part of the overall audit. The team will review the written training program for adequacy of content, frequency of training, effectiveness of training in terms of its goals and objectives as well as to how it fits into meeting the standard's requirements, documentation, etc. Through interviews, the team can determine the employee's knowledge and awareness of the safety procedures, duties, rules, emergency response assignments, etc. During the inspection, the team can observe actual practices such as safety and health policies, procedures, and work authorization practices. This approach enables the team to identify deficiencies and determine where corrective actions or improvements are necessary. An audit is a technique used to gather sufficient facts

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and information, including statistical information, to verify compliance with standards. Auditors should select as part of their preplanning a sample size sufficient to give a degree of confidence that the audit reflects the level of compliance with the standard. The audit team, through this systematic analysis, should document areas which require corrective action as well as those areas where the process safety management system is effective and working in an effective manner. This provides a record of the audit procedures and findings, and serves as a baseline of operation data for future audits. It will assist future auditors in determining changes or trends from previous audits. Corrective action is one of the most important parts of the audit. It includes not only addressing the identified deficiencies, but also planning, followup, and documentation. The corrective action process normally begins with a management review of the audit findings. The purpose of this review is to determine what actions are appropriate, and to establish priorities, timetables, resource allocations, and requirements and responsibilities. In some cases, corrective action may involve a simple change in procedure or minor maintenance effort to remedy the concern. Management of change procedures need to be used, as appropriate, even for what may seem to be a minor change. Many of the deficiencies can be acted on promptly, while some may require engineering studies or indepth review of actual procedures and practices. There may be instances where no action is necessary and this is a valid response to an audit finding. All actions taken, including an explanation where no action is taken on a finding, needs to be documented as to what was done and why. It is important to assure that each deficiency identified is addressed, the corrective action to be taken noted, and the audit person or team responsible be properly documented by the employer. To control the corrective action process, the employer should consider the use of a tracking system. This tracking system might include periodic status reports shared with affected levels of management, specific reports such as completion of an engineering study, and a final implementation report to provide closure for audit findings that have been through management of change, if appropriate, and then shared with affected employees and management. This type of tracking system provides the employer with the status of the corrective action. It also provides the documentation required to verify that appropriate corrective actions were taken on deficiencies identified in the audit.

[Statutory Authority: Chapter 49.17 RCW, 93-21-075 (Order 93-06), § 296-67-291, filed 10/20/93, effective 12/1/93; 92-17-022 (Order 92-06), § 296-67-291, filed 8/10/92, effective 9/10/92.]

WAC 296-67-293 Appendix D—Sources of further information (nonmandatory). (1) Center for Chemical Process Safety, American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (212) 705-7319.

(2) "Guidelines for Hazard Evaluation Procedures," American Institute of Chemical Engineers; 345 East 47th Street, New York, NY 10017.

(3) "Guidelines for Technical Management of Chemical Process Safety," Center for Chemical Process Safety of the American Institute of Chemical Engineers; 345 East 47th Street, New York, NY 10017.

[Title 296 WAC—p. 1905]

(4) "Evaluating Process Safety in the Chemical Industry," Chemical Manufacturers Association; 2501 M Street NW, Washington, DC 20037.

(5) "Safe Warehousing of Chemicals," Chemical Manufacturers Association; 2501 M Street NW, Washington, D.C. 20037.

(6) "Management of Process Hazards," American Petroleum Institute (API Recommended Practice 750); 1220 L Street, N.W., Washington, D.C. 20005.

(7) "Improving Owner and Contractor Safety Performance," American Petroleum Institute (API Recommended Practice 2220); API, 1220 L Street N.W., Washington, D.C. 20005.

(8) Chemical Manufacturers Association (CMA's Manager Guide), First Edition, September 1991; CMA, 2501 M Street, N.W., Washington, D.C. 20037.

(9) "Improving Construction Safety Performance," Report A-3, The Business Roundtable; The Business Roundtable, 200 Park Avenue, New York, NY 10166. (Report includes criteria to evaluate contractor safety performance and criteria to enhance contractor safety performance).

(10) "Recommended Guidelines for Contractor Safety and Health," Texas Chemical Council; Texas Chemical Council, 1402 Nueces Street, Austin, TX 78701-1534.

(11) "Loss Prevention in the Process Industries," Volumes I and II; Frank P. Lees, Butterworth; London 1983.

(12) "Safety and Health Program Management Guidelines," 1989; U.S. Department of Labor, Occupational Safety and Health Administration.

(13) "Safety and Health Guide for the Chemical Industry," 1986, (OSHA 3091); U.S. Department of Labor, Occupational Safety and Health Administration; 200 Constitution Avenue, N.W., Washington, D.C. 20210.

(14) "Review of Emergency Systems," June 1988; U.S. Environmental Protection Agency (EPA), Office of Solid Waste and Emergency Response, Washington, D.C. 20460.

(15) "Technical Guidance for Hazards Analysis, Emergency Planning for Extremely Hazardous Substances," December 1987; U.S. Environmental Protection Agency (EPA), Federal Emergency Management Administration (FEMA) and U.S. Department of Transportation (DOT), Washington, D.C. 20460.

(16) "Accident Investigation*** A New Approach," 1983, National Safety Council; 444 North Michigan Avenue, Chicago, IL 60611-3991.

(17) "Fire Explosion Index Hazard Classification Guide," 6th Edition, May 1987, Dow Chemical Company; Midland, Michigan 48674.

(18) "Chemical Exposure Index," May 1988, Dow Chemical Company; Midland, Michigan 48674.

[Statutory Authority: Chapter 49.17 RCW. 92-17-022 (Order 92-06), § 296-67-293, filed 8/10/92, effective 9/10/92.]

Chapter 296-78 WAC

SAFETY STANDARDS FOR SAWMILLS AND WOODWORKING OPERATIONS

WAC

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296-78-785	Construction requirements.		3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-790	Crane platforms and footwalks.		
296-78-795	Crane cages.	296-78-075	Electrical utilization—General requirements—Grounding noncurrent-carrying metal parts. [Rule D-27, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-800	Crane rail stops, bumpers and fenders.		
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296-78-820	Air hoists.		
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296-78-840	Loading, piling, storage and conveying.		
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296-78-84005	Dry kilns.		
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296-78-84009	Bins and bunkers.		
296-78-84011	Burners.	296-78-100	Electrical utilization—Suitability and size of conductors. [Rule D-32, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
	DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER		
296-78-005	Foreword. [Order 76-7, § 296-78-005, filed 3/1/76; Order 74-28, § 296-78-005, filed 5/7/74; Foreword, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-105	Electrical utilization—Fuses and circuit breakers. [Rule D-33, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-007	Definitions applicable to this chapter. [Order 74-28, § 296-78-007, filed 5/7/74.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-110	Electrical utilization—General requirements for switches—Accessibility, marking and installation. [Rule D-34, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-010	General safety standards. [Rules A-1 through A-19, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-115	Electrical utilization—Guarding switches. [Rule D-35, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-015	Minimum requirements for first aid. [Rule B-1, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-120	Electrical utilization—Platforms and mats. [Rule D-36, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-020	First-aid kit. [Rule B-2, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-125	Electrical utilization—Switchboards and panelboards—Control or arrangement. [Rule D-37, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-025	First-aid room. [Rule B-3, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-130	Electrical utilization—Inclosure of parts. [Rule D-38, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-030	Construction and isolated equipment. [Order 77-12, § 296-78-030, filed 7/11/77; Order 76-7, § 296-78-030, filed 3/1/76; Order 74-28, § 296-78-030, filed 5/7/74; Rules C-1 through C-61, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-135	Electrical utilization—Motors and motor-driven machinery—Grounding machine frames. [Rule D-39, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-035	Mechanical, steam and electrical equipment—General provisions. [Order 74-28, § 296-78-035, filed 5/7/74; Rules D-1 through D-19, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-140	Electrical utilization—Mats and platforms. [Rule D-40, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-040	Boiler and pressure vessels. [Order 74-28, § 296-78-040, filed 5/7/74; Rule D-20, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-145	Electrical utilization—Water barrel rheostats prohibited. [Rule D-41, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-045	Electrical service and equipment. [Order 74-28, § 296-78-045, filed 5/7/74; Rule D-21, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-150	Electrical utilization—Employees—Safety requirements. [Rule D-42, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-050	Electrical utilization—Definitions. [Rule D-22, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-155	Electrical utilization—"Bridging" fuses prohibited. [Rule D-43, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-055	Electrical utilization—General requirements—Safety. [Rule D-23, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-160	Electrical utilization—Leakage of electricity shall be reported. [Rule D-44, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-060	Electrical utilization—General requirements—Current. [Rule D-24, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-162	Electrical utilization—Safe standing room required. [Rule D-45, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-065	Electrical utilization—General requirements—Grounding. [Rule D-25, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.	296-78-165	Electrical utilization—Use of disconnected wires for starting machinery prohibited. [Rules D-46 through D-53, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-070	Electrical utilization—General requirements—Circuits to be grounded. [Rule D-26, effective 6/1/51, filed	296-78-170	Elevators, moving walks and other lifting devices. [Order 76-29, § 296-78-170, filed 9/30/76; Order 74-28, § 296-78-170, filed 5/7/74; Rule D-54, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.

296-78-175	Platform hoists. [Rule D-55, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.		
296-78-180	Transportation—Lumber handling equipment—Cranes—Construction. [Order 74-28, § 296-78-180, filed 5/7/74; Rule E-1, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-265	Vehicles. [Order 77-12, § 296-78-265, filed 7/11/77; Order 74-28, § 296-78-265, filed 5/7/74; Rules E-18 through E-39, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-185	Electrical equipment. [Order 74-28, § 296-78-185, filed 5/7/74; Rule E-2, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-270	Loading, piling, storage and conveying. [Order 76-7, § 296-78-270, filed 3/1/76; Order 74-28, § 296-78-270, filed 5/7/74; Rules F-1 through F-43, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-190	Chains, wire rope, cables and fiber rope. [Order 74-28, § 296-78-190, filed 5/7/74; Rule E-3, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-275	Log dumps and ponds—Headmills. [Order 76-7, § 296-78-275, filed 3/1/76; Order 74-28, § 296-78-275, filed 5/7/74; Rules G-1 through G-50, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-195	Floor operated cranes. [Order 74-28, § 296-78-195, filed 5/7/74; Rule E-4, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-280	Band saws—Saws. [Order 76-7, § 296-78-280, filed 3/1/76; Order 74-28, § 296-78-280, filed 5/7/74; Rule H-1, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-200	Operators. [Order 77-12, § 296-78-200, filed 7/11/77; Order 74-28, § 296-78-200, filed 5/7/74; Rule E-5, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-285	Circular saws. [Order 74-28, § 296-78-285, filed 5/7/74; Rule H-2, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-205	Signalmen. [Order 74-28, § 296-78-205, filed 5/7/74; Rule E-6, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-290	Edgers. [Order 77-12, § 296-78-290, filed 7/11/77; Order 76-7, § 296-78-290, filed 3/1/76; Order 74-28, § 296-78-290, filed 5/7/74; Rules H-3A through H-3J, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-210	Repairmen. [Order 74-28, § 296-78-210, filed 5/7/74; Rule E-7, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-295	Equalizer saws. [Order 74-28, § 296-78-295, filed 5/7/74; Rule H-4, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-215	Construction requirements. [Order 74-28, § 296-78-215, filed 5/7/74; Rule E-8, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-300	Gang saws and re-saws. [Order 74-28, § 296-78-300, filed 5/7/74; Rule H-5, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-220	Crane platforms and footwalks. [Order 74-28, § 296-78-220, filed 5/7/74; Rule E-9, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-305	Jump saws. [Order 74-28, § 296-78-305, filed 5/7/74; Rule H-6, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-225	Crane cages. [Order 74-28, § 296-78-225, filed 5/7/74; Rule E-10, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-310	Saws—Shingle saws. [Rule H-7, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
296-78-230	Crane rail stops, bumpers and fenders. [Order 74-28, § 296-78-230, filed 5/7/74; Rule E-11, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-315	Trimmer and slasher saws. [Order 74-28, § 296-78-315, filed 5/7/74; Rule H-8, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-235	Crawler locomotive and truck cranes. [Order 74-28, § 296-78-235, filed 5/7/74; Rule E-12, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-320	Barrel stave saws. [Order 74-28, § 296-78-320, filed 5/5/74; Rule H-9, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-240	Construction, operation and maintenance—Chain and electric hoists. [Order 74-28, § 296-78-240, filed 5/7/74; Rule E-13, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-325	Swing saws. [Order 74-28, § 296-78-325, filed 5/7/74; Rule H-10, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-245	Monorail hoists. [Order 74-28, § 296-78-245, filed 5/7/74; Rule E-14, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-330	Table saws. [Order 74-28, § 296-78-330, filed 5/7/74; Rule H-11, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-250	Air hoists. [Order 74-28, § 296-78-250, filed 5/7/74; Rule E-15, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-335	Circular saws, speeds, repairs. [Order 74-28, § 296-78-335, filed 5/7/74; Rule H-12, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-255	Jib, pillar, and portable floor cranes, crabs, and winches. [Order 74-28, § 296-78-255, filed 5/7/74; Rule E-16, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.	296-78-340	Saw filing and grinding rooms and equipment. [Order 74-28, § 296-78-340, filed 5/7/74; Rule H-13, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
296-78-260	Standard crane hand signals—Illustration. [Order 74-28, § 296-78-260, filed 5/7/74; Rule E-17, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21),	296-78-345	Miscellaneous woodworking machines—Planers, stickers, molders, matchers. [Order 74-28, § 296-78-345, filed 5/7/74; Rule I-1, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81.

- Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-350 Planers (stave and heading). [Order 74-28, § 296-78-350, filed 5/7/74; Rule I-2, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-355 Stave croziers. [Order 74-28, § 296-78-355, filed 5/7/74; Rule I-3, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-360 Jointers. [Order 74-28, § 296-78-360, filed 5/7/74; Rule I-4, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-365 Jointers (stave and heading). [Order 74-28, § 296-78-365, filed 5/7/74; Rule I-5, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-370 Miscellaneous woodworking machines—Jointers—(Shingle). [Rule I-6, effective 6/1/51, filed 3/23/60.] Repealed by Order 74-28, filed 5/7/74 and Order 76-7, filed 3/1/76.
- 296-78-375 Wood shapers. [Order 74-28, § 296-78-375, filed 5/7/74; Rule I-7, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-380 Boring and mortising machines. [Order 74-28, § 296-78-380, filed 5/7/74; Rule I-8, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-385 Tenoning machines. [Order 74-28, § 296-78-385, filed 5/7/74; Rule I-9, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-390 Lathe (pail and barrel). [Order 74-28, § 296-78-390, filed 5/7/74; Rule I-10, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-395 Sanding machines. [Order 74-28, § 296-78-395, filed 5/7/74; Rule I-11, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-400 Glue machines. [Order 74-28, § 296-78-400, filed 5/7/74; Rule I-12, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-405 Lath mills. [Order 74-28, § 296-78-405, filed 5/7/74; Rule J-1, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-410 Veneer and plywood plants—Peeling and barking. [Order 74-28, § 296-78-410, filed 5/7/74; Rule K-1, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-415 Veneer lathe. [Order 74-28, § 296-78-415, filed 5/7/74; Rules K-2 through K-4, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-420 Veneer slicer and cutter. [Order 74-28, § 296-78-420, filed 5/7/74; Rule K-5, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-425 Veneer clipper. [Order 74-28, § 296-78-425, filed 5/7/74; Rule K-6, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-430 Veneer wringer (swede). [Order 74-28, § 296-78-430, filed 5/7/74; Rule K-7, effective 6/1/51, filed 3/23/60.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.

- 296-78-450 The shake and shingle industry. [Order 76-7, § 296-78-450, filed 3/1/76; Order 74-28, § 296-78-450, filed 5/7/74.] Repealed by 81-18-029 (Order 81-21), filed 8/27/81. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240.
- 296-78-555 First-aid room. [Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-555, filed 8/27/81.] Repealed by 00-01-038, filed 12/7/99, effective 2/1/00. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.

WAC 296-78-500 Foreword. (1) General requirements. The chapter 296-78 WAC shall apply to and include safety requirements for all installations where the primary manufacturing of wood building products takes place. The installations may be a permanent fixed establishment or a portable operation. These operations shall include but are not limited to log and lumber handling, sawing, trimming and planing, plywood or veneer manufacturing, canting operations, waste or residual handling, operation of dry kilns, finishing, shipping, storage, yard and yard equipment, and for power tools and affiliated equipment used in connection with such operation. WAC 296-78-450 shall apply to shake and shingle manufacturing. The provisions of WAC 296-78-500 through 296-78-84011 are also applicable in shake and shingle manufacturing except in instances of conflict with the requirements of WAC 296-78-705. (Rev. 1-28-76.)

(2) This standard shall augment the Washington state general safety and health standards, general occupational health standards, electrical workers safety rules, and any other standards which are applicable to all industries governed by chapter 80, Laws of 1973, Washington Industrial Safety and Health Act. In the event of any conflict between any portion of this chapter and any portion of any of the general application standards, the provisions of this chapter 296-78 WAC, shall apply.

(3) In exceptional cases where compliance with specific provisions of this chapter can only be accomplished to the serious detriment and disadvantage of an operation, variance from the requirement may be permitted by the director of the department of labor and industries after receipt of application for variance which meets the requirements of WAC 296-24-010, general safety and health standards.

(4) No safety program will run itself. To be successful, the wholehearted interest of the employees' group (labor unions) and management must not only be behind the program, but the fact must also be readily apparent to all.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-500, filed 8/27/81.]

WAC 296-78-505 Definitions applicable to this chapter. (1) "A-frame" means a structure made of two independent columns fastened together at the top and separated at the bottom for stability.

(2) "Annealing" heating then cooling to soften and render less brittle.

(3) "Binder" a hinged lever assembly used to connect the ends of a wrapper to tighten the wrapper around the load of logs or materials.

(4) "Boom" logs or timbers fastened together end to end and used to contain floating logs. The term includes enclosed logs.

(5) "Brow log" a log placed parallel to a roadway at a landing or dump to protect vehicles while loading or unloading.

(6) "Bunk" a cross support for a load.

(7) "Cant" a log slabbed on one or more sides.

(8) "Carriage" (log carriage) a framework mounted on wheels which runs on tracts or in grooves in a direction parallel to the face of the saw, and which contains apparatus to hold a log securely and advance it toward the saw.

(9) "Carrier" an industrial truck so designed and constructed that it straddles the load to be transported with mechanisms to pick up the load and support it during transportation.

(10) "Chipper" a machine which cuts material into chips.

(11) "Chock," "bunk block," and "cheese block" a wedge that prevents logs or loads from moving.

(12) "Cold deck" a pile of logs stored for future removal.

(13) "Crotch lines" two short lines attached to a hoisting line by a ring or shackle, the lower ends being attached to loading hooks.

(14) "Dog" (carriage dog) a steel tooth or assembly of steel teeth, one or more of which are attached to each carriage knee to hold log firmly in place on carriage.

(15) "Drag saw" a power-driven, reciprocating cross-cut saw mounted on suitable frame and used for bucking logs.

(16) "Head block" that part of a carriage which holds the log and upon which it rests. It generally consists of base, knee, taper set, and mechanism.

(17) "Head rig" a combination of head saw and log carriage used for the initial breakdown of logs into timbers, cants, and boards.

(18) "Hog" a machine for cutting or grinding slabs and other coarse residue from the mill.

(19) "Husk" a head saw framework on a circular mill.

(20) "Industrial truck" a mobile, power-driven vehicle used to carry, push or pull material. It is designed for "in-plant" or "on-site" use rather than highway use.

(21) "Kiln tender" the operator of a kiln.

(22) "Lift truck" an industrial truck used for lateral transportation and equipped with a power-operated lifting device, usually in the form of forks, for piling or unpling lumber units or packages.

(23) "Live rolls" cylinders of wood or metal mounted on horizontal axes and rotated by power, which are used to convey slabs, lumber, and other wood products.

(24) "Loading boom" any structure projecting from a pivot point and intended to be used for lifting and guiding loads for the purpose of loading or unloading.

(25) "Log" a portion of a tree, usually a minimum of twelve feet in length, capable of being further processed into a variety of wood products.

(26) "Log deck" a platform in the sawmill on which the logs remain until needed for sawing.

(27) "Log haul" a conveyor for transferring logs to mill.

(28) "Lumber dimensions" the nominal size of surfaced lumber, unless otherwise stated.

(29) "Lumber hauling truck" an industrial truck, other than a lift truck or a carrier, used for the transport of lumber.

(30) "Package" a unit of lumber.

(31) "Peavy" a stout wooden handle fitted with a spike and hook and used for rolling logs.

(32) "Peeler block" a portion of a tree usually bucked in two foot intervals plus trim, to be peeled in a lathe or sliced in a slicer into veneer for further processing into plywood.

(33) "Pike pole" a long pole whose end is shod with a sharp pointed spike.

(34) "Pitman rod" connecting rod.

(35) "Resaw" band, circular, or sash gang saws used to break down slabs, cants, or flitches into lumber.

(36) "Running line" any moving rope as distinguished from a stationary rope such as a guyline.

(37) "Safety factor" a calculated reduction factor which may be applied to laboratory test values to obtain safe working stresses for wooden beams and other mechanical members; ratio of breaking load to safe load.

(38) "Saw guide" a device for steadying a circular or bandsaw.

(39) "Setwork" a mechanism on a sawmill carriage which enables an operator to move the log into position for another cut.

(40) "Sorting gaps" the areas on a log pond enclosed by boom sticks into which logs are sorted.

(41) "Spreader wheel" a metal wheel that separates the board from the log in back of circular saws to prevent binding.

(42) "Splitter" a knife-type, nonrotating spreader.

(43) "Sticker" a strip of wood or other material used to separate layers of lumber.

(44) "Stiff boom" the anchored, stationary boom sticks which are tied together and on which boom persons work.

(45) "Swifter" is a tying of boom sticks together to prevent them from spreading while being towed.

(46) "Telltale" a device used to serve as a warning for overhead objects.

(47) "Top saw" the upper of two circular saws on a head rig, both being on the same husk.

(48) "Tramway" a way for trams, usually consisting of parallel tracks laid on wooden beams.

(49) "Trestle" a braced framework of timbers, piles or steelwork for carrying a road or railroad over a depression.

(50) "Wrapper" a chain, strap or wire rope assembly used to contain a load of logs or materials.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-505, filed 8/27/81.]

WAC 296-78-510 Education and first-aid standards.

It shall be the duty of every employer to comply with such standards and systems of education for safety as shall be, from time to time, prescribed for such employer by the director of labor and industries through the division of industrial safety and health or by statute.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-510, filed 8/27/81.]

WAC 296-78-515 Management's responsibility. (1) It

shall be the responsibility of management to establish, supervise, and enforce, in a manner which is effective in practice:

(a) A safe and healthful working environment.

(b) An accident prevention program as required by these standards.

(c) Training programs to improve the skill and competency of all employees in the field of occupational safety and health. Such training shall include the on-the-job instructions on the safe use of powered materials handling equipment, machine tool operations, use of toxic materials and operation of utility systems prior to assignments to jobs involving such exposures.

(2) The employer shall develop and maintain a hazard communication program as required by chapter 296-62 WAC, Part C, which will provide information to all employees relative to hazardous chemicals or substances to which they are exposed, or may become exposed, in the course of their employment.

(3) Management shall not assign mechanics, millwrights, or other persons to work on equipment by themselves when there is a probability that the person could fall from elevated work locations or equipment or that a person could be pinned down by heavy parts or equipment so that they could not call for or obtain assistance if the need arises.

Note: This subsection does not apply to operators of motor vehicles, watchperson or certain other jobs which, by their nature, are singular employee assignments. However, a definite procedure for checking the welfare of all employees during their working hours shall be instituted and all employees so advised.

(4) After the emergency actions following accidents that cause serious injuries that have immediate symptoms, a preliminary investigation of the cause of the accident shall be conducted. The investigation shall be conducted by a person designated by the employer, the immediate supervisor of the injured employee, witnesses, employee representative if available and any other person with the special expertise required to evaluate the facts relating to the cause of the accident. The findings of the investigation shall be documented by the employer for reference at any following formal investigation.

(5) Reporting of fatality or multiple hospitalization incidents.

(a) Within eight hours after the fatality or probable fatality of any employee from a work-related incident or the inpatient hospitalization of two or more employees as a result of a work-related incident, the employer of any employees so affected shall report the fatality/multiple hospitalization by telephone or in person, to the nearest office of the department or by using the OSHA toll-free central telephone number, 1-800-321-6742.

(i) This requirement applies to each such fatality or hospitalization of two or more employees which occurs within thirty days of the incident.

(ii) Exception: If any employer does not learn of a reportable incident at the time it occurs and the incident would otherwise be reportable under this subsection, the employer shall make a report within eight hours of the time the incident is reported to any agent or employee of the employer.

(iii) Each report required by this subsection shall relate the following information: Establishment name, location of the incident, time of the incident, number of fatalities or hos-

pitalized employees, contact person, phone number, and a brief description of the incident.

(b) Equipment involved in an incident resulting in an immediate or probable fatality or in the in-patient hospitalization of two or more employees, shall not be moved, until a representative of the department investigates the incident and releases such equipment, except where removal is essential to prevent further incident. Where necessary to remove the victim, such equipment may be moved only to the extent of making possible such removal.

(c) Upon arrival of a department investigator, employer shall assign to assist the investigator, the immediate supervisor and all employees who were witnesses to the incident, or whoever the investigator deems necessary to complete the investigation.

(6) A system for maintaining records of occupational injuries and illnesses as prescribed by chapter 296-27 WAC.

Note: Recordable cases include:

- (a) Every occupational death.
- (b) Every industrial illness.
- (c) Every occupational injury that involves one of the following:
 - (i) Unconsciousness.
 - (ii) Inability to perform all phases of regular job.
 - (iii) Inability to work full time on regular job.
 - (iv) Temporary assignment to another job.
 - (v) Medical treatment beyond first aid.

All employers with eleven or more employees shall record occupational injury and illness information on forms OSHA 101 - supplementary record occupational injuries and illnesses and OSHA 200 - log and summary. Forms other than OSHA 101 may be substituted for the supplementary record of occupational injuries and illnesses if they contain the same items.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-78-515, filed 9/30/94, effective 11/20/94; 91-24-017 (Order 91-07), § 296-78-515, filed 11/22/91, effective 12/24/91; 89-11-035 (Order 89-03), § 296-78-515, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-515, filed 8/27/81.]

WAC 296-78-520 Employee's responsibility. (1)

Employees shall coordinate and cooperate with all other employees in an attempt to eliminate accidents.

(2) Employees shall study and observe all safe practices governing their work.

(3) Employees should offer safety suggestions, wherein such suggestions may contribute to a safer work environment.

(4) Employees shall apply the principles of accident prevention in their daily work and shall use proper safety devices and protective equipment as required by their employment or employer.

(5) Employees shall properly care for all personal protective equipment.

(6) Employees shall make a prompt report to their immediate supervisor, of each industrial injury or occupational illness, regardless of the degree of severity.

(7) Employees shall not wear torn or loose clothing while working around machinery.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-520, filed 8/27/81.]

WAC 296-78-525 Accident-prevention programs.

Each employer shall develop a formal accident-prevention program, tailored to the needs of the particular plant or operation and to the type of hazards involved. The department may be contacted for assistance in developing appropriate programs.

(1) The following are the minimal program elements for all employers:

(a) A safety orientation program describing the employer's safety program and including:

(i) How and when to report injuries, including instruction as to the location of first-aid facilities.

(ii) How to report unsafe conditions and practices.

(iii) The use and care of required personal protective equipment.

(iv) The proper actions to take in event of emergencies including the routes of exiting from areas during emergencies.

(v) Identification of the hazardous gases, chemicals or materials involved along with the instructions on the safe use and emergency action following accidental exposure.

(vi) A description of the employers total safety program.

(vii) An on-the-job review of the practices necessary to perform the initial job assignments in a safe manner.

(b) A designated safety and health committee consisting of management and employee representatives with the employee representatives being elected or appointed by fellow employees.

(2) Each accident-prevention program shall be outlined in written format.

[Statutory Authority: Chapter 49.17 RCW, 94-20-057 (Order 94-16), § 296-78-525, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-525, filed 8/27/81.]

WAC 296-78-530 Safety and health committee plan.

(1) All employers of eleven or more employees, shall have a designated safety committee composed of employer and employee elected members.

(a) The terms of employee-elected members shall be a maximum of one year. Should a vacancy occur on the committee, a new member shall be elected prior to the next scheduled meeting.

(b) The number of employer-selected members shall not exceed the number of employee-elected members.

(2) The safety committee shall have an elected chairperson.

(3) The safety committee shall be responsible for determining the frequency of committee meetings.

Note: If the committee vote on the frequency of safety meetings is stalemated, the division's regional safety educational representative may be consulted for recommendations.

(a) The committee shall be responsible for determining the date, hour and location of the meetings.

(b) The length of each meeting shall not exceed one hour except by majority vote of the committee.

(4) Minutes of each committee meeting shall be prepared and filed for a period of at least one year and shall be made available for review by noncompliance personnel of the division of industrial safety and health.

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(5) Safety and health committee meetings shall address the following:

(a) A review of the safety and health inspection reports to assist in correction of identified unsafe conditions or practices.

(b) An evaluation of the accident investigations conducted since the last meeting to determine if the cause of the unsafe acts or unsafe conditions involved was properly identified and corrected.

(c) An evaluation of the accident or illness prevention program with the discussion of recommendation for improvement where indicated.

(d) The attendance shall be documented.

(e) The subject(s) discussed shall be documented.

(6) All employers of ten or less employees and employers of eleven or more employees where the employees are segregated on different shifts or in widely dispersed locations in crews of ten or less employees, may elect to have foreman-crew meetings in lieu of a safety and health committee plan provided:

(a) Foreman-crew safety meetings be held at least once a month, however, if conditions require, weekly or semi-monthly meetings shall be held to discuss safety problems as they arise.

(b) All items under subsection (5) of this section shall be covered.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-530, filed 8/27/81.]

WAC 296-78-535 Safety bulletin board. There shall be installed and maintained in every fixed establishment, a safety bulletin board sufficient in size to display and post safety bulletins, newsletters, posters, accident statistics and other safety educational material. It is recommended that safety bulletin boards be painted green and white.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-535, filed 8/27/81.]

WAC 296-78-540 First-aid training and certification.

The employer must ensure that first-aid trained personnel are available to help employees who are injured or who become acutely ill on the job. The employer must meet this requirement by maintaining first-aid trained staff on the job site. The employer must ensure that:

(1) Each person in charge of employees has first-aid training; or another person with first-aid training is present or available to the employees. Such training must be successfully completed every two years as required in chapter 296-24 WAC, Part A-1;

(2) Documentation of first-aid training is kept as required in chapter 296-24 WAC, Part A-1;

(3) Emergency telephone numbers are adequately posted;

(4) First-aid training includes the core elements contained in chapter 296-24 WAC, Part A-1.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 00-01-038, § 296-78-540, filed 12/7/99, effective 2/1/00. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-540, filed 8/27/81.]

(2001 Ed.)

WAC 296-78-545 First-aid supplies. The first-aid kits and supplies requirements of the general safety and health standards, chapter 296-24 WAC, Part A-1 apply within the scope of chapter 296-78 WAC.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 00-01-038, § 296-78-545, filed 12/7/99, effective 2/1/00. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-545, filed 8/27/81.]

WAC 296-78-550 First-aid station. Employers with fifty or more employees per shift at one location must establish a first-aid station in accordance with the requirements in chapter 296-24 WAC, Part A-1.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 00-01-038, § 296-78-550, filed 12/7/99, effective 2/1/00. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-550, filed 8/27/81.]

WAC 296-78-560 Safe place standards. (1) Each employer shall furnish to each of his employees a place of employment free from recognized hazards that are causing or likely to cause serious injury or death to his employees.

(2) Every employer shall furnish and use safety devices and safeguards, and shall adopt and use practices, means, methods, operations, and processes which are reasonably adequate to render such employment and place of employment safe. Every employer shall do every other thing reasonably necessary to protect the life and safety of employees.

(3) No employer shall require any employee to go or be in any employment or place of employment which is not safe.

(4) No employer shall fail or neglect:

(a) To provide and use safety devices and safeguards.

(b) To adopt and use methods and processes reasonably adequate to render the employment and place of employment safe.

(c) To do every other thing reasonably necessary to protect the life and safety of employees.

(5) No employer, owner, or lessee of any real property shall construct or cause to be constructed any place of employment that is not safe.

(6) No person shall do any of the following:

(a) Remove, displace, damage, destroy or carry off any safety device, safeguard, notice, or warning, furnished for use in any employment or place of employment.

(b) Interfere in any way with the use thereof by any other person.

(c) Interfere with the use of any method or process adopted for the protection of any employee, including himself, in such employment, or place of employment.

(d) Fail or neglect to do every other thing reasonably necessary to protect the life and safety of employees.

(e) Intoxicating beverages and narcotics shall not be permitted or used in or around work sites. Workers under the influence of alcohol or narcotics shall not be permitted on the work site. This rule does not apply to persons taking prescription drugs and or narcotics as directed by a physician providing such use shall not endanger the worker or others.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-560, filed 8/27/81.]

(2001 Ed.)

WAC 296-78-565 Log dumps and ponds—Head-mills.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-565, filed 8/27/81.]

WAC 296-78-56501 Log dumps and ponds. (1) Log dumps, booms, ponds or storage areas, if used at night, shall be illuminated in accordance with the requirements of WAC 296-62-09003, general occupational health standards.

(2) A log dump shall be constructed at each log pond or decking ground. Log trucks shall not be unloaded by use of peavies or by hand.

(a) The roadbed shall be of hard packed gravel, heavy planking or equivalent material and shall be maintained at all times. Roadbeds at log dumps shall be of width and evenness to insure safe operation of equipment.

(b) A mechanical unloading device shall be provided and used for unloading logs. Log unloading areas shall be arranged and maintained to provide a safe working area.

(c) Signs prohibiting unauthorized foot or vehicle traffic in log unloading and storage areas shall be posted.

(d) At no time shall one person be permitted to work alone on a log dump, a booming or rafting grounds, or a log pond.

(3) Water log dumps. Ungrounded electrically powered hoists using handheld remote control in grounded locations, such as log dumps or mill log lifts, shall be actuated by circuits operating at less than 50 volts to ground.

(4)(a) A brow log, skid timbers or the equivalent shall be installed on all log dumps.

(b) Where logs are unloaded onto skids, sufficient space shall be provided between the top of the skids and the ground to accommodate the body of a person.

(c) All truck dumps shall be built with not more than six inches variation of level from side to side.

(5)(a) All truck log dumps shall be equipped with a positive safeguard to prevent logs from leaving the load on the side opposite the brow log. Jill pokes shall not be used on truck log dumps.

(b) Unloading lines shall be attached and tightened or other positive safeguard in place before binder chains are released at any log dump.

(c) Stakes and chocks which trip shall be constructed in such manner that the tripping mechanism that releases the stake or chocks is activated at the opposite side of the load being tripped.

(d) Binders shall be released only from the side on which the unloader operates, except when released by remote control devices or except when person making release is protected by racks or stanchions or other equivalent means.

(e) Loads on which a binder is fouled by the unloading machine shall have an extra binder or metal band of equal strength placed around the load, or the load shall be otherwise secured so that the fouled binder can be safely removed.

(f) Unloading lines, crotch lines, or equally effective means shall be arranged and used in a manner to minimize the possibility of any log swinging or rolling back.

(6)(a) In unloading operations, the operator of unloading machine shall have an unobstructed view of the vehicle and the logs being unloaded.

(b) Unloading lines shall be arranged so that it is not necessary for the employees to attach them from the pond or dump site of the load except when entire loads are lifted from the log-transporting vehicle.

(7) All log dumps shall be kept reasonably free of bark and other debris.

(8) Employees shall remain in the clear until all moving equipment has come to a complete stop.

(9) Artificial log ponds subject to unhealthy stagnation shall be drained, cleansed, and water changed at least once every six months.

(10) All employees whose regular work requires walking on logs shall wear spiked or caked shoes, except when working in snow.

(11) Employees working on, over or along water, where the danger of drowning exists, shall be provided with and shall wear approved personal flotation devices.

(a) Employees are not considered exposed to the danger of drowning:

(i) When working behind standard height and strength guardrails;

(ii) When working inside operating cabs or stations which eliminate the possibility of accidentally falling into the water;

(iii) When wearing approved safety belts with lifeline attached so as to preclude the possibility of falling into the water;

(iv) When water depth is known to be chest-deep or less.

(b) Prior to and after each use, personal floating devices shall be inspected for defects which would reduce their designed effectiveness. Defective personal flotation devices shall not be used.

(c) To meet the approved criteria required by this subsection (11), a personal flotation device shall be approved by the United States Coast Guard as a Type I PFD, Type II PFD, Type III PFD, or Type V PFD, or their equivalent, pursuant to 46 CFR 160 (Coast Guard lifesaving equipment specifications) and 33 CFR 175.23 (Coast Guard table of devices equivalent to personal flotation devices). Ski belt or inflatable type personal flotation devices are specifically prohibited.

(12)(a) Wooden pike poles shall be of continuous, straight grained No. 1 material. Defective poles, blunt or dull pikes shall not be used.

(b) Aluminum or other metal poles shall not be used where hazard of coming in contact with live electric wires exists.

(13)(a) Walkways and floats shall be provided and security anchored to provide safe passage for workers.

(b) Permanent cable swifters shall be so arranged that it will not be necessary to roll boom sticks in order to attach or detach them.

(c) Inspection of cable or dogging lines shall be made as necessary to determine when repair or removal from service is necessary.

(14)(a) Decks of floats or other walkways shall be kept above the waterline at all times and shall be capable of supporting four times the load to be imposed.

(b) Floating donkeys or other power-driven machinery used on booms shall be placed on a raft or float with enough buoyancy to keep the deck above water.

(15)(a) All regular boom sticks and foot logs shall be reasonably straight, have all protruding knots and bark removed, and shall be capable of supporting above the waterline at either end, any necessary weight of workers and equipment.

(b) Stiff booms shall be two float logs wide secured by boom chains or other connecting devices, and of a width adequate for the working needs. Walking surfaces shall be free of loose material and maintained in good repair.

(c) Boom sticks shall be fastened together with crossties or couplings.

[Statutory Authority: Chapter 49.17 RCW. 89-11-035 (Order 89-03), § 296-78-56501, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-56501, filed 8/27/81.]

WAC 296-78-56503 Log hauls. (1) Every log haul used as a walkway shall have at least one walkway with standard railing to enable workers to stand clear of the logs in the chute. Cleats shall be installed to provide safe footing on sloping walkways.

(2) Workers shall not stand under or dangerously near to logs that are being hoisted vertically to the log deck.

(3)(a) Log haul gears and bull chain drive mechanism shall be adequately guarded for the protection of employees.

(b) Log haul bull chains or cable shall be designed, installed, and maintained to provide a 4 to 1 safety factor for the intended load.

(c) Troughs for the return strand of log haul chains shall be provided over passageways.

(d) Overhead protection shall be provided for employees working below logs being moved to the log deck.

(4) Log haul controls shall be arranged to operate from a position where the operator will at all times be in the clear of logs, machinery lines and rigging. Such controls shall operate mechanism only when moved toward the log slip or deck.

(5) Where possible an automatic stop shall be installed on all log hauls. A positive stop shall be installed on all log hauls to prevent logs from traveling too far ahead in the mill.

(6)(a) Slip persons shall handle pike poles in such manner as to be in the clear in case of a slip back.

(b) All sorting gaps shall have a stiff boom on each side.

(c) The banks of the log pond in the vicinity of the log haul shall be reinforced to prevent caving in.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-56503, filed 8/27/81.]

WAC 296-78-56505 Boats and mechanical devices on waters. (1) The applicable provisions of the Standard for Fire Protection for Motorcraft, NFPA No. 302-1994, shall be complied with. Prior to starting the boat motor, any spilled fuel shall be removed and vapors shall be exhausted from any area in which they may accumulate.

(2) The bilge area shall be kept clean and oil, grease, fuel, or highly combustible materials shall not be allowed to accumulate.

(3) Adequate ventilation equipment shall be provided and used for the bilge area to prevent the accumulation of toxic or explosive gases or vapors.

(4) Adequate ventilation equipment shall be provided and used for the cabin area on enclosed cabin-type boats to prevent an accumulation of harmful gases or vapors.

(5) Deck and cabin lighting shall be provided and used where necessary to provide safe levels of illumination aboard boats. Boats operated during the period from sunset to sunrise, or in conditions of restricted visibility, shall display navigation lights as required by the United States Coast Guard. Searchlights or floodlights shall be provided to facilitate safe navigation and to illuminate working or boarding areas adjacent to the craft.

(6) Decks of pond boats shall be covered with nonslip material. On craft used by workers wearing calked shoes, all areas where the operator or workers must stand or walk shall be made of or be covered with wood or other suitable matting or nonslip material and such covering shall be maintained in good condition.

(7) Each boat shall be provided with a fire extinguisher and life ring with at least fifty feet of one-fourth inch line attached. On log broncs, boom-scooters, or other small boomboats where all occupants are required to wear life saving devices and a life ring would present a tripping hazard, the life ring may be omitted.

(8)(a) Along docks, walkways, or other fixed installations on or adjacent to open water more than five feet deep, approved life rings with at least ninety feet of one-fourth inch line attached, shall be provided. The life rings shall be spaced at intervals not to exceed two hundred feet and shall be kept in easily visible and readily accessible locations.

(b) When employees are assigned work at other casual locations where exposure to drowning exists, at least one approved life ring with at least ninety feet of line attached, shall be provided in the immediate vicinity of the work assigned.

(c) When work is assigned over water where the vertical drop from the accidental fall would exceed fifty feet, special arrangements shall be made with and approved by the department of labor and industries prior to such assignment.

(d) Lines attached to life rings on fixed locations shall be at least ninety feet in length, at least one-fourth inch in diameter, and have a minimum breaking strength of five hundred pounds. Similar lines attached to life rings on boats shall be at least fifty feet in length.

(e) Life rings must be United States Coast Guard approved thirty-inch size.

(f) Life rings and attached lines shall be maintained to retain at least seventy-five percent of their designed buoyancy and strength.

(g) Log broncs, boom-scooters, and boomboats shall not be loaded with personnel or equipment so as to adversely affect their stability or seaworthiness.

(h) Boats shall not be operated at an excessive speed or handled recklessly.

(i) Boat fuel shall be transported and stored in approved containers. Refer to WAC 296-24-58501(19) for definition of approved.

[Statutory Authority: Chapter 49.17 RCW, 96-17-056, § 296-78-56505, filed 8/20/96, effective 10/15/96; 88-23-054 (Order 88-25), § 296-78-56505, filed 11/14/88. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-56505, filed 8/27/81.]

(2001 Ed.)

WAC 296-78-56507 Log decks. (1) Dry deck storage.

(a) Dry deck storage areas shall be kept orderly and shall be maintained in a condition which is conducive to safe operation of mobile equipment.

(b) Logs shall be stored in stabilized piles, and roadways and traffic lanes shall be maintained at a width adequate for safe travel of log handling equipment.

(c) Logs shall be arranged to minimize the chance of accidentally rolling from the deck.

(2)(a) Employees shall not spool cable on winch or drums with their hands.

(b) Log wells shall be provided with safeguard to prevent logs from rolling back into well off log deck.

(3) Jump skids on log decks shall be installed in grooves in a manner that they cannot work out onto the carriage way.

(4)(a) Log decks shall be provided with effective means to prevent logs from accidentally rolling down the deck onto the carriage or its runway.

(b) Swing saws. Swing saws on log decks shall be equipped with a barricade and stops for protection of employees who may be on the opposite side of the log haul chute.

(c) Drag saws. Where reciprocating log cutoff saws (drag saws) are provided, they shall not project into walkway or aisle.

(d) Circular cutoff saws. Circular log bucking or cutoff saws shall be so located and guarded as to allow safe entrance to and exit from the building.

(e) Entrance doorway. Where the cutoff saw partially blocks the entrance from the log haul runway the entrance shall be guarded.

(5) A barricade or other positive stop shall be erected between the sawyer's stand and the log deck to protect the sawyer from rolling logs. Such barricade or stop shall be of sufficient strength to stop any log.

(6) Chains from overhead canting gear or other equipment shall not be allowed to hang over the log deck in such manner as to endanger workers.

(7) Canting gear control levers shall be so arranged that they move away from the carriage to operate.

(8) Moving parts or equipment on or about log decks shall be guarded.

(9) Peavies, canthooks and other hand tools shall be kept in good repair at all times.

(10) Workers shall not go below logs on decks that are likely to roll or be rolled. Means of access shall be provided to the head rig which does not subject employees to the hazard of moving logs or equipment.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-56507, filed 8/27/81.]

WAC 296-78-56509 Mechanical barkers. (1) Rotary barkers. Rotary barking devices shall be so guarded as to protect employees from flying chips, bark, or other extraneous material.

(2) Elevating ramp. If an elevating ramp or gate is used, it shall be provided with a safety chain, hook, or other means of suspension while employees are underneath.

(3) Area around barkers. The hazardous area around ring barkers and their conveyors shall be fenced off or posted as a prohibited area for unauthorized persons.

(4) Enclosing hydraulic barkers. Hydraulic barkers shall be enclosed with strong baffles at the inlet and outlet. The operator shall be protected by adequate safety glass or equivalent.

(5) Holddown rolls. Holddown rolls shall be installed at the infeed and outfeed sections of mechanical ring barkers to control the movement of logs.

(6) If such holddown rolls have a tendency to throw logs or chunks, horseshoe or equivalent type guards shall be installed to contain the logs or chunks.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-56509, filed 8/27/81.]

WAC 296-78-56511 Head rigs and feed works. (1) A clear walkway shall be provided along the upper side of the log deck and around the head rig unless an overhead walkway is provided.

(2) The sawyer shall be primarily responsible for the safety of the carriage crew and off-bearers. He shall exercise due care in the operation of the carriage and log turning devices.

(3) Feedworks and log turning control levers shall be so arranged that they may be securely locked when not in use and shall be guarded against accidental contact.

(4)(a) A positive means shall be provided to prevent unintended movement of the carriage. This shall involve a control locking device, a carriage tie-down, or both.

(b) An emergency control or equally effective means shall be provided so that the sawyer may stop the head rig section of the mill without leaving the operator station.

(5) An effective method of disengaging the head rig saws from the power unit shall be installed on all head rigs where the power unit is not directly controlled by the sawyer. The saws shall be disengaged from the source of power while repairs or changes are made.

(6) A shield of lexan, makrolon, merlon, plestar, or equivalent transparent material, shall be installed between the sawyer's stand and the head saws in all circular mills. In band mills and chipper type installations, a wire screen of not less than twelve gauge wire, one-half inch mesh, mounted in a frame in compliance with the requirements of WAC 296-24-20531 of the general safety and health standards, is an acceptable substitute for the type shield required in circular mills.

(7) Safety glasses, safety shields or other suitable eye protection shall be provided for and use by head rig off-bearers.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-56511, filed 8/27/81.]

WAC 296-78-56513 Log carriages. (1) Carriages upon which employees are required to work shall be solidly decked over.

(2) Dogs. Dogging devices shall be adequate to secure logs, cants, or boards, during sawing operations.

(3) The feed control lever of friction or belt driven carriage feed works shall be arranged to operate away from the saws or carriage track.

(4) A quick action valve, controlled from the sawyer's stand, shall be located in the steam line to any steam operated feed works. The valve shall be tested daily.

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(5) Valves in steam feeds shall be closed and locked in a neutral position before the sawyer leaves his station. Leaking steam valves or piping shall not be used on carriage drives.

(6)(a) Where employees ride the headrig carriage, clearance of the rear edge of the carriage shall be either not more than two inches or shall be not less than thirty inches from the side wall of the building. The side wall shall be boarded over smoothly to height of not less than six feet six inches from the setter's platform and for at least the length of the carriage travel. Where the clearance is thirty inches or more the floor between the back side of the setter's platform and the wall shall be raised to the level of the platform. The clearance between the floor edge and the platform shall not be more than two inches.

(b) Barriers and warning signs. A barrier shall be provided to prevent employees from entering the space necessary for travel of the carriage, with headblocks fully retracted, for the full length and extreme ends of carriage runways. Warning signs shall be posted at possible entry points to this area.

(7) Safe access to the head rig shall be provided.

(8) No roof truss or roof timber or other obstruction shall be located within six feet six inches of the upper surface of the setter's platform on any carriage.

(9) Doors which lead onto a passageway at the end or side of the carriage runway shall be provided with a handrail opposite such doorway. Handrail shall not be less than eighteen inches from the carriage run. A warning sign shall be posted on the entrance side of such doorways.

(10) A stop or bumper capable of stopping the loaded carriage at operating speed shall be installed at each end of the carriage run.

(11) Rail sweeps shall be installed in front of the front wheels in the direction of travel. Such sweeps shall extend to within one-fourth inch of the rail.

(12) Where power operated log turners are used, carriage knees shall be provided with goosenecks or other means of protecting the carriage crew from climbing logs.

(13) Employees shall use a stick or wire brush to clear head blocks of debris.

(14) All weakened or broken carriage boards which will not support the load to be imposed with a safety factor of 4, shall be immediately replaced.

(15) Carriage control. A positive means shall be provided to prevent unintended movement of the carriage. This may involve a control locking device, a carriage tie-down, or both.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-56513, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-56513, filed 8/27/81.]

WAC 296-78-570 Band saws—Saws. (1) Band head rigs shall be given a thorough daily inspection and any deficiency reported and corrected.

(2) Any band saw found to have developed a crack greater than one-tenth the width of the saw shall be removed from service until the width of the saw is reduced to eliminate the crack, the cracked section is removed, or the development of the crack is arrested by welding.

(2001 Ed.)

(3) Band saws shall not be continued in use of the head rig for which they have been designed after they have been reduced forty percent in width.

(4) Leather gloves, or equivalent hand protection, shall be worn by employees while changing band saws.

(5) All head band saw wheels shall have a minimum rim thickness of five-eighths inch, except for a distance of not to exceed one inch from the front edge of the wheel.

(6) Provisions shall be made for alerting and warning employees before starting band head saws, and measures shall be taken to insure that all persons are in the clear.

(7) No band saw shall be run at a peripheral speed in excess of that recommended by the manufacturer. The manufacturer's recommended maximum speed shall be stamped in plainly legible figures on some portion of the assembly.

(8) A band wheel that has developed a crack in the rim shall be immediately removed from service. If a crack has developed in a spoke the wheel shall be removed from service until repaired.

(9) All band wheels shall be completely encased or guarded on both sides. The exposed part of the saw blade on the uptravel between the two wheels shall be encased, and no portion of the blade exposed, except such part of the cutting edge as is essential for sawing the material at hand.

(10) All band wheel guards shall be constructed of not less than ten U.S. gauge metal, or not less than two inch wood material or equivalent, attached to the frames. Ventilating ports shall not exceed 2 x 4 inches in size. Openings necessary for lubrication or repair of the saw shall have doors or gates of equivalent strength to the remainder of the guard, and such doors or gates shall be securely closed during operation.

(11) Every band mill shall be equipped with a saw catcher, rest or guard of substantial construction.

(12) All band saws other than head mills shall be enclosed or guarded except the working side of the blade between the guide and the table. The guard for the portion of the saw between the sliding guide and the upper saw wheel guard shall be adjusted with the guide.

(13) Each gang ripper of band or straight saw type shall have the cutting edges of the saw guarded by a hood or screen secured to the framework of the machine.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-570, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-570, filed 8/27/81.]

WAC 296-78-575 Circular saws. (1) Single circular head saws. Circular head saws shall not be operated at speeds in excess of those specified by the manufacturer. Maximum speed shall be etched on the saw.

(2) On all circular saw mills the horizontal distance from the side of the saw to the nearest post of the husk or frame shall be at least one inch greater than the clear vertical distance between the collars of the top and bottom saws.

(3) Circular head saws shall be equipped with safety guides that can be readily adjusted without use of wrench or other hand tools. Brackets or edging supports shall be installed between the saw and the side of the husk.

(2001 Ed.)

(4) The upper saw of a double circular mill shall be provided with a hood or guard. A screen or other suitable device shall be placed so as to protect the sawyer from flying particles.

(5) All circular sawmills where live rolls are not used behind the head saw shall be equipped with an effective spreader or splitter. In any mill where the head saw is used for edging lumber, the splitter shall be solid and stationary and shall extend above the head blocks.

(6) Drag saws or circular cut-off saws shall be so arranged that they will not project into any passageway. When existing installations do not leave clear passage, saws shall be fenced off in order to make it impossible for anyone to walk into them. Means to securely hold material being sawed shall be provided wherever such material creates a hazard.

(7) All employees shall be in the clear before starting operation of drag or swing cut-off saws.

(8) Twin circular head saws. Twin circular head saw rigs such as scrag saws, shall meet the specifications for single circular head saws in subsection (1) of this section, where applicable.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-575, filed 8/27/81.]

WAC 296-78-580 Edgers. (1) Edgers shall be guarded by a metal housing of ten gauge sheet metal, ten gauge by one-half inch mesh wire, screen, or by a baffle of not less than two inch wood material.

(2) Openings in end frames shall be enclosed with sheet metal, wire screen or wood and may be hinged or arranged to permit oiling and removal of saws.

(3) The top of the edger shall be guarded to prevent contact by employees or debris being thrown and all chains and gears fully enclosed as required by WAC 296-78-710 of this chapter.

(4) Vertical arbor edgers installed ahead of the main saw shall be so located and guarded that an employee cannot contact any part of the edger saws from his normal operating position.

(5) Edgers shall not be located in the main roll case behind the head saw.

(6) All edgers shall be equipped with pressure feed rolls. The controls shall be installed and located so that from the normal work station the operator can quickly stop the infeed drive without releasing the hold down tension of the pressure rolls.

(7) All edgers shall be provided with a method of preventing or guarding against kickbacks. Finger units or dogs installed at the edger, or hinged steel plates suspended across the feed table may be used for this purpose. A kickback barricade, in line with the edger, if fenced off may be used.

(8) Pressure and feed rolls on edgers shall be guarded against accidental contact by means of roll covers, bars or strips. The pressure rolls shall not be lifted while stock is being run, or while any person is in line with the feed side of the saws.

(9) Edger men shall not raise feed rolls and reach between saws while edger is in operation.

(10) Edger men shall not put hands on cants being run through the edger.

(11) Live rolls and rotating powered tailing devices in back of edger shall operate at a speed not less than the speed of the edger feed rolls.

(12) Tables in back of edgers shall be kept clear of cants, edgings and unnecessary debris.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-580, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-580, filed 8/27/81.]

WAC 296-78-585 Equalizer saws. (1) Equalizer saws for bolts, staves, heading, etc., shall have the saws encased, except that portion immediately adjacent to the feeding device.

(2) Feeding devices on all such equipment shall be provided with guards to prevent contact with the feeding device by employees.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-585, filed 8/27/81.]

WAC 296-78-590 Gang saws and re-saws. (1) Gang saws and re-saws shall be fully guarded or housed in accordance with conditions. Cranks, pitman rods, and other moving parts shall be guarded.

(2) Feed rolls shall be enclosed by a cover over the top, front, and open ends except where guarded by location. Drive mechanism to feed rolls shall be enclosed.

(3) Feed rolls shall be enclosed and if the operator stands within thirty inches of the feed rolls, they shall be so guarded as to prevent operator coming into contact with them.

(4) Circular re-saws or rip saws, except power feed rip saws with a roller or wheel back of the saw, shall be provided with splitters or spreaders.

(5) A hood of metal or wood of sufficient strength to give protection against splinters or flying teeth shall be provided over all circular rip saws.

(6) That portion of the saw extending below the table shall be so guarded as to prevent contact.

(7) Circular rip saws shall be equipped with a standard anti-kickback device.

(8) Carriage cradles of whole-log sash gang saws, Swedish gangs shall be of height to prevent logs from kicking out while being loaded.

(9) Band re-saws. Band re-saws shall meet the specifications for band head saws as required in WAC 296-78-570(7).

(10) Circular gang re-saws.

(a) Banks of circular gang re-saws shall be guarded by a hood to contain teeth or debris which can be thrown by the saws.

(b) Circular gang re-saws shall be provided with safety fingers or other anti-kickback devices.

(c) Circular gang re-saws shall not be operated at speeds exceeding those recommended by the manufacturer.

(d) Feed belts and drive pulleys shall be guarded in accordance with the requirements of WAC 296-24-205 through 296-24-20533 of the general safety and health standard.

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(e) Each circular gang re-saw, except self-feed saws with a live roll or wheel at back of saw, shall be provided with spreaders.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-590, filed 8/27/81.]

WAC 296-78-595 Jump saws. (1) Jump saws shall have guards below the top of the table or roll case. A guard shall be placed over the roll casing to prevent persons from walking into or over the saw.

(2) Jump saws, underhung swing saws, or bed trimmers shall be so arranged that the saws are fully enclosed when not in actual use.

(3) A positive stop shall be installed to prevent the saw from passing the front edge of the roll case or table. The throat in the table or roll case shall be only wide enough to permit unobstructed operation of the saw.

(4) Guards constructed of not less than two inch wood material or of heavy wire mesh mounted in a steel frame shall be placed in front of jump saw trimmers. Stops shall be installed to prevent timber from being thrown off the roll case.

(5) Foot treadle operated saws shall be provided with safeguards to prevent accidental contact.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-595, filed 8/27/81.]

WAC 296-78-600 Trimmer and slasher saws. (1) Trimmer of [and] slasher saws shall be guarded in front by a flat or round steel framework with a rigid metal screen or light iron bars attached thereto, or by wood baffles of not less than two inch wood material securely bolted to the frame.

Maximum speed. Trimmer saws shall not be run at peripheral speeds in excess of those recommended by the manufacturer.

(2) Front guards for a series of saws shall be set as close to the top of the feed table as is practical when considering the type of machine in use and the material being cut. The end saws of a series shall be guarded or fenced off.

(3) The rear of a series of saws shall have a stationary or swinging guard of not less than two inch wood material or equivalent the full width of the saws and as much wider as is necessary to protect persons at the rear of the trimmer.

(4) Safety stops. Automatic trimmer saws shall be provided with safety stops or hangers to prevent saws from dropping on table.

(5) Feed chains shall be stopped while employees are on the feed table.

(6) Spotters for trimmers or slashers shall be provided with goggles or other eye protection when conditions so warrant.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-600, filed 8/27/81.]

WAC 296-78-605 Swing saws. (1) Manually operated swing cut-off saws of the following types shall be set up, guarded and operated in accordance with WAC 296-24-16515, general safety and health standards:

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- Saws into which materials to be cut are fed or positioned and/or held in position by hand pressure during the cutting stroke; and/or

- Saws on which the cutting stroke is propelled by hand pressure; and/or

- Saws on which the operator is within arm's reach of the blade when the operator is standing at the operator's control station and the blade is fully extended to the limit of operating travel.

(2) Operators of hand operated swing saws shall not stand directly in front of saw while making a cut.

(3) Swing cut-off saws which are fed by powered live rolls, conveyor chains and/or belts and which are operated from a remote operator's station (defined as being beyond arm's reach of the blade when the blade is fully extended to the limit of operating travel) shall be set up, guarded and operated in accordance with the following:

(a) Overhead swing cut-off saws shall be guarded by a hood which shall cover the upper half of the cutting edge at least to the depth of the teeth.

(b) The driving belts on overhead swing cut-off saws, where exposed to contact, shall be provided with guards as required by WAC 296-78-71505.

(c) Saws shall be completely enclosed when in idle position.

(d) Power operated swing saws shall have controls so arranged that the operators will not stand directly in front of saw when making cut.

(e) All swing saws shall be equipped with a counter balance which shall be permanently fastened to the frame of the saw and so arranged or adjusted that it will return the saw beyond the rear edge of the table or roll case without a rebounding motion. Wire rope, chain or nonmetallic rope running to a weight over a sheave shall not be used for attaching counter balance.

(f) No swing cut-off or trim saw shall be located directly in line with stock coming from an edger.

(g) Swing limit stops shall be provided and so adjusted that at no time shall the forward swing of the saw extend the cutting edge of the saw beyond a line perpendicular with the edge of the saw table, roll case, guard or barrier.

(h) Saws that are fed into the cut by means of air, steam, hydraulic cylinders, or other power device or arrangement shall be designed so they can be locked or rendered inoperative.

(i) Foot treadle operated saws shall be provided with safeguards to prevent accidental contact.

(j) Swing saws on log decks shall be equipped with a positive stop for the protection of persons who may be on the opposite side of the log haul chute.

(k) Tables or roll casings for swing saws shall be provided with stops or lineup rail to prevent material being pushed off on opposite side.

(4) Operators of hand operated swing saws shall not stand directly in front of saw while making cut.

[Statutory Authority: Chapter 49.17 RCW, 96-17-056, § 296-78-605, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-605, filed 8/27/81.]

(2001 Ed.)

WAC 296-78-610 Circular saws, speeds, repairs. (1) Circular saws shall not be operated at speeds in excess of that specified by the manufacturer. Speeds shall be etched on all new saws. When saws are repaired, remanufactured or retensioned in any way to change their operating speeds, such change of speed shall be etched on the saw. These etched speeds shall not be exceeded.

(2) Circular saws shall be inspected for cracks each time that the teeth are filed or set.

(3) A circular saw shall be discontinued from use until properly repaired when found to have developed a crack equal to the length indicated in the following table:

Length of Crack	Diameter
1/2 .inch	Up to 12"
1 .inch	Over 12" to 24"
1-1/2 .inch	Over 24" to 36"
2 .inch	Over 36" to 48"
2-1/2 .inch	Over 48" to 60"
3 .inch	Over 60"

(4) Welding or slotting of cracked saws shall be done by a sawsmith under a procedure recommended by the saw manufacturer. Holes shall not be drilled in saws as a means of arresting cracks. After saws are repaired they shall be retensioned. Unless a sawsmith is employed, saws shall be returned to the manufacturer for welding or tensioning.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-610, filed 8/27/81.]

WAC 296-78-615 Saw filing and grinding rooms and equipment. (1) Approaches to filing rooms shall be kept free from material and equipment at all times.

(2) Enclosed grinding and filing rooms shall be ventilated as specified in the general occupational health standard, WAC 296-62-110 through 296-62-11019.

(3) Each filing and grinding room shall be provided with two exits so arranged as to permit easy escape in case of fire.

(4) Floor shall be cleaned regularly and shall be kept free from oil, grease and other materials that might cause employees to slip or fall.

(5) Flooring around machines shall be kept in good repair at all times.

(6) Saw grinding machine belts shall be provided with guards where these belts pass through the frame of the machine.

(7) All grinding wheels on such machines shall be provided with a metal retaining hood which shall also cover the arbor ends if they are exposed to contact.

(8) Filing room employees shall be provided with goggles, face shields, or other necessary protective equipment and are required to wear the same.

(9) Guarding and mounting of abrasive wheels shall be in accordance with WAC 296-24-18003 through 296-24-18007 of the general safety and health standards.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-18-029 (Order 81-21), § 296-78-615, filed 8/27/81.]

WAC 296-78-620 Miscellaneous woodworking machines—Planers, stickers, molders, matchers. (1) Each planing, molding, sticking and matching machine shall have all cutting heads, and saws if used, covered by a solid metal

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guard. If such guard is constructed of sheet metal, the material used shall be not less than one-sixteenth inch in thickness, and if cast iron is used, it shall be not less than three-sixteenths inch in thickness.

(2) Planers, stickers, molding, sticking and matching machines shall be provided with exhaust fans, hoods and dust conveyors to remove the harmful dusts, etc., from the vicinity of the operator. Such hoods may be arranged to serve as guards for cutting heads.

(3) Planers and other machinery or equipment shall not be oiled while in motion, unless provided with guards or other devices to permit oiling without any possibility of contact with moving parts of machinery.

(4) Feed rolls shall be guarded by means of roll covers, bars or strips, attached to the roll frame in such manner as to remain in adjustment for any thickness of lumber.

(5)(a) Levers or controls shall be so arranged or guarded as to prevent accidental operation of machines.

(b) Foot treadle operated machines shall have a treadle guard fastened over the treadle.

(c) Locks, blocks, or other device shall be provided for positive immobilization of machine controls while repairs or adjustments are being made.

(6) Side head hoods shall be of sufficient height to safeguard the head set screw.

(7) Side heads shall not be adjusted while machine is in operation, except when extension adjusting devices are provided.

(8) Side belt and pulley guards shall be kept in place at all times the machine is in motion.

(9) All universal joints shall be enclosed.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-620, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-620, filed 8/27/81.]

WAC 296-78-625 Planers (stave and headings). (1)

Each planer (stave and heading) shall have all cutting heads, and saws if used, covered by a solid metal guard.

(2) Stave and heading planers shall be provided with exhaust fans, hoods and dust conveyors to remove the harmful dusts, etc., from the vicinity of the operator. Such hoods may be arranged to serve as guards for cutting heads.

(3) Sectional feed rolls should be provided. Where solid feed rolls are used, a sectional finger device (or other means equally effective) shall be provided to prevent kickbacks.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-625, filed 8/27/81.]

WAC 296-78-630 Stave croziers. (1) Stave croziers shall have the heads guarded completely by the exhaust hood or other device, except that portion which actually inbeds itself in the stock.

(2) Each stave crozier shall have all feed chains and sprockets completely enclosed.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-630, filed 8/27/81.]

WAC 296-78-635 Jointers. (1) Each hand feed jointer or buzz planer with horizontal head shall be provided with an

automatic guard over the cutting head both in front of and in back of the guide.

(2) Each jointer or buzz planer with horizontal head shall be equipped with a cylindrical cutting head, the throat of which shall not exceed three-eighths inch in depth or one-half inch in width. The knife projection shall not exceed one-eighth inch beyond the cylindrical body of the head.

(3) The opening in the table shall be kept as small as possible. The clearance between the edge of the rear table and the cutter head shall be not more than one-eighth inch. The table throat opening shall be not more than two and one-half inches when tables are set or aligned with each other for zero cut.

(4) Each jointer or buzz planer with vertical head shall be guarded by an exhaust hood or other approved device which shall completely enclose the revolving head except for a slot sufficiently wide to permit the application of material. The guard shall effectively protect the operator's hand from coming in contact with the revolving knives. The guard shall automatically adjust itself to cover the unused portion of the head and shall remain in contact with the material at all times.

(5) Push sticks shall be provided and used for feeding stock through hand operated jointers or buzz planers.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-635, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-635, filed 8/27/81.]

WAC 296-78-640 Jointers (stave and heading). (1)

Stave and heading jointers and matchers shall have the heads guarded completely by the exhaust hood or other device, except that portion where the stock is applied.

(2) Foot power stave jointing machines shall have the knife effectively guarded to prevent the operator's fingers from coming in contact with it.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-640, filed 8/27/81.]

WAC 296-78-645 Wood shapers. (1) The cutting head of each wood shaper, hand feed panel raiser, or other similar machine not automatically fed, shall be guarded with a cage or pulley guard or other device so designed as to keep the operator's hands away from the cutting edge. In no case shall a warning device of leather or other material attached to the spindle be acceptable. Cylindrical heads shall be used wherever the nature of the work permits. The diameter of circular shaper guards shall be not less than the greatest diameter of the cutter.

(2) All double spindle shapers shall be provided with a spindle starting and stopping device for each spindle or provision shall be made that only one spindle operate at any one time.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-645, filed 8/27/81.]

WAC 296-78-650 Boring and mortising machines.

(1) Boring and mortising machines shall be provided with safety bit chucks without projecting set screws. Automatic machines shall be provided with point of operation guards. When necessary to prevent material from revolving with the

bit, clamps or stops shall be provided and used to hold material firmly against the guides.

(2) The requirements of WAC 296-24-16525, general safety and health standards, shall be applicable to boring and mortising machines.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-650, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-650, filed 8/27/81.]

WAC 296-78-655 Tenoning machines. (1) Each tenoning machine shall have all cutting heads, saws if used, and all exposed moving parts guarded. In the case of cutting heads and saws, the guard shall be of solid metal.

(2) If sheet metal is used, it shall be not less than ten U.S. gauge in thickness. If cast metal is used it shall be not less than three-sixteenths inch thick, or if aluminum is used, it shall be not less than five-eighths inch thick. The hood of the exhaust system may form part or all of the guard. When so used, the hood shall be constructed of metal of a thickness not less than that specified herein.

(3) Feed chains and sprockets of all double end tenoning machines shall be completely enclosed, except that portion of chain used for conveying stock. At rear ends of frames over which the feed conveyors run, sprockets and chains shall be guarded at the sides by plates projecting beyond the periphery of sprockets and ends of lugs.

(4) The rear end of the frame over which the feed conveyors run shall be so extended that the material as it leaves the machine will be guided to a point within easy reach of the person removing stock at the rear of the tenoner.

(5) Single end tenoners, hand fed, shall have a piece of sheet metal placed so that the operator's hands cannot slip off the lever handle into the tool in passing. Such guard shall be fastened to the lever.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-655, filed 8/27/81.]

WAC 296-78-660 Lathe (pail and barrel). (1) Each profile, swing-head and back-knife lathe shall have all cutting heads covered by a solid metal guard.

(2) If sheet metal is used, it shall be not less than ten U.S. gauge in thickness. If cast metal is used, it shall be not less than three-sixteenths inch thick, or if aluminum is used, it shall be not less than five-eighths inch thick. The hood of the exhaust system may form part or all of the guard. When so used, the hood shall be constructed of metal of a thickness not less than that specified above.

(3) Pail and barrel lathes shall be guarded in accordance with the specifications for profile and back-knife lathes insofar as they are applicable.

(4) The requirements of WAC 296-24-16531, general safety and health standards, shall be applicable to pail and barrel lathes.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-660, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-660, filed 8/27/81.]

(2001 Ed.)

WAC 296-78-665 Sanding machines. (1) Each belt sanding machine shall have both pulleys enclosed in such a manner as to guard the points where the belt runs onto the pulleys. The edges of the unused run of belt shall be enclosed or otherwise guarded from contact by employees.

(2) Each drum sanding machine shall be provided with a guard so arranged as to completely enclose the revolving drum except such portion required for the application of the material to be finished. Guards with hinges to facilitate the insertion of sandpaper may be installed. The exhaust hood may form part or all of this guard. When so used, the hood shall conform to the specifications as given under exhaust systems in WAC 296-78-710.

(3) All standard stationary sanding machines shall be provided with exhaust systems in conformity with the section of this code dealing with exhaust systems.

(4) All portable sanding machines shall be provided with means of removing excessive dust, or employees using equipment shall be provided with such necessary respiratory protective equipment as will conform to the requirements of the general occupational health standards, chapter 296-62 WAC, Part E.

(5) The requirements of WAC 296-24-16533, general safety and health standards, shall be applicable to sanding machines.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-78-665, filed 5/4/99, effective 9/1/99. Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-665, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-665, filed 8/27/81.]

WAC 296-78-670 Glue machines. (1) Personal protective equipment as required by the general safety and health standard, chapter 296-24 WAC, Part A-2, and the general occupational health standard, WAC 296-62-11021, and proper washing facilities with noncaustic soap and sterilizers, shall be provided for all employees handling glue. Rubber gloves and other personal equipment must be sterilized when transferred from one person to another.

(2) Glue spreaders shall be enclosed on the in-running side, leaving only sufficient space to insert the stock.

(3) All glue spreaders shall be equipped with a panic bar or equivalent type device that can be reached from either the infeed or outfeed side of the spreader to shut-off the power in an emergency situation. Such device shall be installed on existing glue spreaders no later than April 1, 1982, and be standard equipment on any glue spreader purchased after January 1, 1982.

(4) All glue mixing and handling rooms where located above work areas shall have water tight floors.

(5) All glue rooms shall be provided with ventilation in accordance with WAC 296-62-110 through 296-62-11013, of the general occupational health standard.

[Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-78-670, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-670, filed 8/27/81.]

WAC 296-78-675 Lath mills. (1) Lath mills shall be so arranged that stock pickers shall be protected from slabs and blocks from slasher and trimmers.

[Title 296 WAC—p. 1921]

(2) Bolters and lath machines shall be provided with a wall or shield of not less than two inch wood material or equivalent, constructed in front of the machines, to protect stock pickers and passing employees from kickbacks.

(3) Lath bolters and lath mills shall have all feed rolls, belts, gears and moving parts provided with approved guards. Feed chains shall be guarded to as low a point as the maximum height of the stock will permit.

(4)(a) Lath bolters and lath mill saws shall be provided with a sheet metal guard not less than one-eighth inch thick, or a cast iron guard not less than three-sixteenths inch thick, or equivalent. These hoods may be hinged so that they can be turned back to permit changing of the saws.

(b) A metal plate baffle, finger device or other device, shall be installed to prevent kickbacks.

(5)(a) The feed rolls on bolters or lath mills shall not be raised while any employee is in line with the saws.

(b) The stock shall be pushed through the saws with another piece of stock or push stick.

(6)(a) The lath trimmer shall be provided with guards on the ends, the top and the rear so designed as to contain debris and prevent employee contact with the saw. The belt drive shall be provided with guards as required by WAC 296-78-710.

(b) The entire top half of all trimmer saws shall be provided with guards. The guards shall be so adjusted as to prevent employees from accidentally contacting saws.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-675, filed 8/27/81.]

WAC 296-78-680 Veneer and plywood plants—Peeling and barking. (1) Where peeling or barking pits are located directly under the log cranes, logs shall not be moved over workers.

(2) Single spiked hooks without a bell shall not be used for handling logs. Hooks shall be equipped with hand holds and shall be maintained in condition to safely perform the job application.

(3) Mechanical barking devices shall be so guarded as to protect employees from flying chips, bark or other matter.

(4) Logs shall not be removed from barker until barking head has ceased to revolve, unless barker is so designed and arranged that barking head will not create or constitute a hazard to employees.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-680, filed 8/27/81.]

WAC 296-78-685 Veneer lathe. (1) The elevating ramp (gate) shall be provided with a safety chain and hook or other positive means of suspension while employees are working underneath same.

(2) The area under the tipple from lathe to stock trays shall be provided with railings or other suitable means of preventing employees from entering this area, if access is not prevented by the construction of the machine and employees can enter this area.

(3) Catwalks shall be provided along stock trays so that employees will not have to climb on the sides of trays to straighten stock.

[Title 296 WAC—p. 1922]

(4) Any section of stock trays shall be locked out or shall have an operator stationed at starting controls while stock is being removed or adjusted.

(5) Guards which will cover the cutting edge of veneer lathe and clipper blades shall be provided and used while such blades are being transported about premises.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-685, filed 8/27/81.]

WAC 296-78-690 Veneer slicer and cutter. (1) Each veneer slicer and each rotary veneer cutter shall have all revolving and other moving knives provided with guards.

(2) The requirements of WAC 296-24-16535, general safety and health standards, shall be applicable to veneer slicers and cutters.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-690, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-690, filed 8/27/81.]

WAC 296-78-695 Veneer clipper. (1) Each veneer clipper shall have either automatic feed or shall be provided with a guard which will make it impossible to place any portion of the hand under the knife while feeding stock. Where practicable, such guard shall be of the vertical finger type.

(2) The rear of each manually operated clipper shall be guarded either by a screen or vertical finger guard which shall make it impossible for any portion of the hand to be placed under the knife while removing clipped stock.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-695, filed 8/27/81.]

WAC 296-78-700 Veneer wringer (swede). The entry side of each veneer wringer other than glue spreader shall be enclosed, leaving only sufficient space to insert stock. A guard shall be provided to prevent the veneer from overriding the top roll and kicking back.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-700, filed 8/27/81.]

WAC 296-78-705 The shake and shingle industry. The following terms and standards shall apply only in the manufacturing of shakes and shingles and these requirements shall take precedence over other sawmill and woodworking standards.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-705, filed 8/27/81.]

WAC 296-78-70501 Definitions—Terms, general. (1) "Block(s)" - those sections of a log cut in various lengths.

(2) "Block(s)" and "bolt(s)" may be considered to be synonymous.

(3) "Clipper saw" - a circular saw used to trim manufactured shingles.

(4) "Groover" - a cylinder-type knife (knives) similar to a planer knife (knives), used to cut grooves into the face surface of shakes or shingles.

(5) "Hip" and "ridge saw" - a circular saw used to cut various angles on the side edge of shakes or shingles.

(6) "Johnson bar" - a shaft used to control the feed of the carriage.

(7) "Knee bolter circular saw" - a stationary circular saw used to trim and debark blocks (the blocks are manually maneuvered onto a carriage and fed into a saw).

(8) "Log haul" - a power conveyor used to move logs to mill.

(9) "Packers" - employees who pack the manufactured shakes or shingles into bundles.

(10) "Panagraph power splitter" - a hydraulically operated wedge, manually positioned into place, used to split blocks.

(11) "Power saw splitter" - a stationary circular saw used to split (saw) blocks, (the blocks are manually maneuvered onto a carriage and fed into the saw).

(12) "Set works" - a component of the shingle machine, located on the machine frame, used to control the thickness of each shingle being manufactured.

(13) "Shake machine" - a band saw used to cut shake blanks into manufactured shakes.

(14) "Shake splitter" - a stationary hydraulically operated wedge, manually controlled, used to split shake blocks into shake blanks or boards.

(15) "Shim saw" - a circular saw used to re-cut manufactured shingles into narrow widths.

(16) "Shingle machine" - a machine used to manufacture shingles; composed of a feed, set works, and carriage system, all functioning in relation to a circular saw.

(17) "Shingle saw" - a circular saw used to cut shingles from blocks.

(18) "Spault" - the first and last section(s) of a block as it is cut into shingles.

(19) "Spault catcher" - a device located on the shingle machine next to the solid feed rolls, used to hold the last section of each block being cut (called a spault), in place.

(20) "Track or swing cutoff saw" - a circular saw used to cut blocks from a log.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-70501, filed 8/27/81.]

WAC 296-78-70503 Shake and shingle machinery—

General. (1) Track or swing cutoff circular saw.

(a) Manually operated track or swing circular cutoff saws of the following types shall be set up, guarded and operated in accordance with WAC 296-24-16515, general safety and health standards:

- Saws into which materials to be cut are fed or positioned and/or held in position by hand pressure during the cutting stroke; and

- Saws on which the cutting stroke is propelled by manual (hand) pressure; and

- Saws on which the operator is within arm's reach of the blade when the blade is fully extended to the limit of operating travel and the operator is standing at the operator's normal control station/location.

(b) Large track or swing circular cutoff saws into which materials to be cut are fed by powered live rolls, conveyor belts and/or chains and which are operated from a remote operator's control station, defined as beyond arm's reach when the blade is fully extended to the limit of operating

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travel, shall be set up, guarded and operated in accordance with the following:

(i) A power operated track or swing cutoff circular saw shall have controls so arranged that operators are not positioned directly in front of the saw while making a cut.

(ii) All track or swing cutoff circular saws shall be completely encased or guarded when the saw is in the retract position, except for that portion of the guard that must be left open for the operation of the saw.

(iii) Track or swing cutoff circular saw guards shall be constructed of sheet metal not less than one-eighth inch thick, or a wood guard of not less than nominal two inch thick wood material, or equivalent.

Hinged or removable doors or gates will be permitted where necessary to permit adjusting and oiling.

(iv) The driving belt(s) on the track or swing cutoff circular saw shall be guarded in accordance with the general safety and health standard, WAC 296-24-205 through 296-24-20533.

(v) A safety catch shall be provided to prevent the track cutoff saw from leaving the track.

(2) Overhead deck splitter - panagraph.

(a) Panagraph splitters shall have a shroud incorporated on the upper pressure plate to eliminate the possibility of the splitter moving from the operating area. This shroud shall be constructed of solid design with a minimum width of three inches and a minimum thickness of three-eighths inch.

(b) Mechanically operated overhead splitters shall have handles moving opposite the stroke of the piston.

(c) When the leading edge of the panagraph splitter is completely extended, the maximum clearance from the deck to the splitting edge shall be two inches.

(3) Power splitter saw. Power splitters shall have spreaders behind the saw to prevent materials from squeezing the saw or being thrown back on the operator. The top of the saw shall be completely covered.

(4) Knee bolter circular saw.

(a) A safety catch shall be provided to prevent the bolter carriage from leaving the track.

(b) Bolter saws shall be provided with a canopy guard of sheet metal not less than one-eighth inch thick, or cast iron guard not less than three-sixteenths inch thick or a wood guard of not less than nominal four inch thick wood material or equivalent.

The bolter canopy guard shall completely enclose the rear portion of the saw. It shall be so arranged and adjusted as to cover the front of the saw; not to exceed twenty inches from the top of the carriage to the bottom of the guard on sixteen inch and eighteen inch block and twenty-six inches on twenty-four inch blocks, of the material being cut.

(c) Bolter saws shall be provided with wipers of belting or other suitable material. These wipers shall be installed on both sides of the saw in such a manner as to deflect knots, chips, slivers, etc., that are carried by the saw.

(d) A positive device shall be provided and used to manually lock and hold the feed table in the neutral position when not in use.

(e) That portion of all bolter saws which is below and behind the saw table shall be guarded by the exhaust hood or

other device. Hinged or removable doors or gates will be permitted where necessary to permit adjusting and oiling.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-70503, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-70503, filed 8/27/81.]

WAC 296-78-70505 Shake machinery. (1) Shake splitters.

(a) A positive deenergizing device shall be provided within ready reach of each shake splitter operator.

(b) Each shake splitter shall be provided with an adjustable stroke limiter to eliminate the splitting blade from striking the table.

(c) All splitters shall have a maximum clearance of four inches, from the splitting edge to the table surface, when the splitter is in the extended position.

(d) All splitter tables shall have a friction surface to reduce kick out of the material being split.

(e) Shake splitters shall not be operated at a speed that would cause chunks to be thrown in such a manner as to create a hazard.

(f) The use of foot pedal (treadle) mechanisms shall be provided with protection to prevent unintended operation from falling or moving objects or by accidental stepping onto the pedal.

(i) The pedal shall have a nonslip surface.

(ii) The pedal return spring shall be of the compression type, operating on a rod or guided within a hole or tube, or designed to prevent interleaving of spring coils in event of breakage.

(iii) If pedal counterweights are provided, the path of the travel of the weight shall be enclosed.

(2) Shake saw guards.

(a) Every shake band saw shall be equipped with a saw guard on both sides of the blade down to the top side of the guide.

(b) The outside saw guard shall extend a minimum of three and one-half inches below the bottom edge of the saw guide.

(c) The maximum opening between the saw guide and table rolls shall be fifteen inches.

(3) Shake saw band wheel guards.

(a) The band wheels on all shake band saws shall be completely encased or guarded on both sides. The guards shall be constructed of not less than No. 14 U.S. gauge metal or material equal in strength.

(b) The metal doors, on such guards, shall have a wood liner of a minimum thickness of one-half inch.

(4) Shake saw band wheel speeds and maintenance.

(a) No band wheel shall be run at a peripheral speed in excess of that recommended by the manufacturer.

(b) Each band wheel shall be carefully inspected at least once a month by management.

Any band wheel in which a crack is found in the rim or in a spoke shall be immediately discontinued from service until properly repaired.

(c) Each band saw frame shall be provided with a tension indicator.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-70505, filed 8/27/81.]

WAC 296-78-70507 Upright shingle machine. (1) Upright shingle saw guard.

(a) Every shingle machine carriage shall be equipped with a hand guard which:

(i) Projects at least one inch beyond the cutting edge of the saw.

(ii) Shall be located not more than one-half inch from the side of the saw blade.

(b) Shingle saw guards shall have a rim guard so designed and installed as to prevent chips and knots from flying from the saws. Such guards shall cover the edge of the saw to at least the depth of the teeth, except such part of the cutting edge as is essential for sawing the material.

(c) Saw arbors and couplings shall be guarded to prevent contact.

(d) Every part of a clipper saw blade, except that part which is exposed to trim shingles, shall be enclosed by a guard, so designed and installed to prevent contact with the clipper saw. An additional guard shall be installed not more than four inches above the clipper board and not more than one-half inch from the vertical plane of the saw.

(e) The underside of clipper saw boards shall be equipped with a finger guard to effectively protect the operator's fingers. The guard shall be a minimum of five inches long and one and one-quarter inches deep.

(2) Upright carriage guards.

(a) Automatic revolving cam set works and rocker arms, on machine frame, shall be guarded where exposed to contact.

(b) The spault catchers shall be not less than three-sixteenths inch thick and kept sharp at all times. Missing teeth shall be replaced.

(3) Carriage feed works.

(a) The pinion gear, bull wheel and Johnson bar, operating the saw carriage, shall be guarded where exposed to contact.

(b) Each shingle machine clutch treadle shall be arranged so that it is necessary to manually operate the treadle to start the machine. Devices which start the machine when the jaw treadle is released shall not be installed or used. The carriage shall have a brake to hold it in a neutral position.

(c) Carriage speed shall not exceed thirty-four strokes per minute.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-70507, filed 8/27/81.]

WAC 296-78-70509 Related shake and shingle sawing machinery. (1) Flat or taper saw. A wood or metal guard or its equivalent shall be secured to the sliding table at the side nearest the sawyer to protect him from contact with the cutting edge of the saw when a block is not in the cut.

(2) Hip and ridge saws. The hip and ridge saws shall be guarded with a hood-like device. This guard shall cover that portion of the saw not needed to cut the material, located above the cutting table.

(a) The remaining portion of the saw, located below the table, shall be guarded to prevent contact by employees.

(b) The hip and ridge guarding standard is applicable to both shake and shingle hip and ridge saws.

(3) Shim stock saws. The top ends and sides of the shim stock saws shall be guarded. All shim stock saw power transmission mechanism shall be guarded.

(4) Shake or shingle groover. The top ends and sides of the groover, to include the press rolls, shall be guarded to contain material or debris which can be thrown and to prevent contact. All groover machine power transmission mechanism shall be guarded in compliance with WAC 296-78-710.

(5) Circular saws, speeds and repairs.

(a) Maximum allowable speeds.

(i) No circular saw shall be run at a speed in excess of that recommended by the manufacturer.

(ii) Such speed shall be etched or otherwise permanently marked on the blade, and that speed shall not be exceeded.

(b) Repairs and reconditions.

(i) Shingle saws when reduced in size to less than forty inches in diameter shall be discontinued from service as shingle saws on upright or vertical machines.

(ii) Shingle saws may be reconditioned for use as clipper saws provided the surface is reground and the proper balance attained.

(iii) Shingle saws may be used to no less than thirty-six inches on flat or taper saw machines.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-70509, filed 8/27/81.]

WAC 296-78-70511 Safety rules. (1) General.

(a) Workers shall not leave shingle machines unattended while the carriage is in motion.

(b) Shingle blocks shall not be piled more than one tier high on tables or roll cases. Chunks may be placed horizontally one tier high on top of shingle blocks. Shingle blocks shall be piled in a stable manner, not more than seventy-two inches high, within the immediate working area of the shingle sawyer or the area shall be barricaded.

(c) Provisions shall be made to prevent blocks from falling into the packing area.

(d) On each machine operated by electric motors, positive means shall be provided for rendering such controls or devices inoperative while repairs or adjustments are being made to the machines they control.

(e) Workers shall not stand on top of blocks while in the process of splitting other blocks into bolts.

(2) Jointers (shingle). Shingle jointers shall have the front, or cutting face of the knives, housed except for a narrow slot through which the shingles may be fed against the knives.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-70511, filed 8/27/81.]

WAC 296-78-710 Construction and isolated equipment.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-710, filed 8/27/81.]

WAC 296-78-71001 General. (1) Construction when not specifically covered in these standards shall be governed

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by such other standards adopted by the department of labor and industries as may apply.

(2) All buildings, docks, tramways, walkways, log dumps and other structures shall be so designed, constructed, and maintained as to provide a safety factor of four. This means that all members shall be capable of supporting four times the maximum load to be imposed. This provision refers to buildings, docks and so forth designed and constructed subsequent to the effective date of these standards and also refers in all cases where either complete or major changes or repairs are made to such buildings, docks, tramways, walkways, log dumps and other structures.

(3) Basements on ground floors under mills shall be evenly surfaced, free from unnecessary obstructions and debris, and provided with lighting facilities in compliance with the requirements of the general occupational health standards, WAC 296-62-09003.

(4) All engines, motors, transmission machinery or operating equipment installed in mill basements or ground floors shall be equipped with standard safeguards for the protection of workers.

(5) Hazard marking. Physical hazard marking shall be as specified in WAC 296-24-135 through 296-24-13503 of the general safety and health standards.

(6) Flooring of buildings, ramps and walkways not subject to supporting motive equipment shall be of not less than two-inch wood planking or material of equivalent structural strength.

(7) Flooring of buildings, ramps, docks, trestles and other structure required to support motive equipment shall be of not less than full two and one-half inch wood planing or material of equivalent structural strength. However, where flooring is covered by steel floor plates, two inch wood planking or material of equivalent structural strength may be used.

(8) Walkways, docks, and platforms.

(a) Walkways, docks and platforms shall be constructed and maintained in accordance with the requirements of the general safety and health standards, WAC 296-24-735 through 296-24-75011.

(b) Maintenance. Walkways shall be evenly floored and kept in good repair.

(c) Where elevated platforms are used they shall be equipped with stairways or ladders in accordance with the general safety and health standards, WAC 296-24-765 through 296-24-81013.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71001, filed 8/27/81.]

WAC 296-78-71003 Floor and wall openings. (1) All floor and wall openings either temporary or permanent, shall be protected as required by the general safety and health standards, WAC 296-24-750 through 296-24-75011.

(2) The area under floor openings shall, where practical, be fenced off. When this is not practical, the areas shall be plainly marked with yellow lines and telltails shall be installed to hang within five and one-half feet of the ground or floor level.

(3) Where floor openings are used to drop materials from one level to another, audible warning systems shall be

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installed and used to indicate to employees on the lower level that material is to be dropped.

[Statutory Authority: Chapter 49.17 RCW, 96-17-056, § 296-78-71003, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71003, filed 8/27/81.]

WAC 296-78-71005 Floors, docks, platforms and runways. (1) Faces of docks except on loading and unloading sides of rail and truck loading platforms, and runways used for the operation of lift trucks and other vehicles shall have a guard or shear timber eight by eight inches set over three inch blocks and securely fastened to the floor by bolts of not less than five-eighths inch diameter.

(2) The flooring of buildings, docks and passageways shall be kept in good repair at all times. When a hazardous condition develops that cannot be immediately repaired, the area shall be fenced off and not used until adequate repairs are made.

(3) All working areas shall be kept free from unnecessary obstruction and debris.

(4) Floors around machines and other places where workers are required to stand shall be provided with effective means to prevent slipping.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71005, filed 8/27/81.]

WAC 296-78-71007 Footwalks and passageways. (1) All footwalks and passageways subject to slipping hazards due to peculiarities of conditions or processes of the operation shall be provided with nonslip surfaces.

(2) Walkways in accordance with WAC 296-78-71001(8) shall be provided over roll casings, transfer tables, conveyors or other moving parts except where stepping over such equipment is not in connection with usual and necessary traffic.

(3) Walkways alongside of sorting tables shall be of sufficient width to provide safe working area. Such walkways shall be evenly floored and kept in good repair at all times. They shall be kept free from obstructions and debris.

(4) When employees are required to clear plug-ups in veneer trays or lumber sorting trays, adequate walkways with standard guardrails shall be provided for access to the trays whenever possible. When walkways are not provided, safety belts or harnesses with lanyards, tied off to substantial anchorages, shall be provided and used at all times.

(5) Walkways and stairways with standard hand rails shall be provided wherever space will permit, for oilers and other employees whose duties require them to go consistently to elevated and hazardous locations.

(a) Where such passageways are over walkways or work areas, standard toeboards shall be provided.

(b) Protection as required by the general safety and health standard, WAC 296-24-205 through 296-24-20533 shall be provided against contact with transmission machinery or moving conveyors.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71007, filed 8/27/81.]

[Title 296 WAC—p. 1926]

WAC 296-78-71009 Stairways and ladders. (1) Stairways shall be used in preference over ladders wherever possible. Stairways or ladders, whichever is used, shall be constructed and maintained in accordance with the provisions of the general safety and health standard, WAC 296-24-75009 through 296-24-81013.

(2) Doors shall not open directly on a flight of stairs.

(3) Permanent ladders shall be fastened securely at both top and bottom.

(4) Portable ladders shall not be used upon footing other than suitable type.

(5) Hooks or other means of securing portable ladders when in use, shall be provided.

(6) Portable ladders shall not be used for oiling machinery which is in motion.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71009, filed 8/27/81.]

WAC 296-78-71011 Egress and exit. (1) In all enclosed buildings, means of egress shall be provided in accordance with the provisions of the general safety and health standard, WAC 296-24-550 through 296-24-56531.

(2) All swinging doors shall be provided with windows, the bottom of which shall be not more than forty-eight inches above the floor. One window shall be provided for each section of double swinging doors. All such windows shall be of shatter proof or safety glass unless otherwise protected against breakage.

(3) Outside exits shall open outward. Where sliding doors are used as exits, an inner door not less than two feet six inches by six feet shall be cut inside each of the main doors and arranged to open outward.

(4) At least two fire escapes or substantial outside stairways, shall be provided for mill buildings where the floor level is more than eight feet above the ground.

(a) Buildings over one hundred fifty feet in length shall have at least one additional fire escape or substantial outside stairway for each additional one hundred fifty feet of length or fraction thereof.

(b) Passageways to fire escapes or outside stairways shall be marked and kept free of obstructions at all times.

(c) Fire protection. The requirements of WAC 296-24-585 through 296-24-62003 of the general safety and health standard, shall be complied with in providing the necessary fire protection for sawmills.

(d) Fire drills shall be held at least quarterly and shall be documented.

(5) Where a doorway opens upon a roadway, railroad track, or upon a tramway or dock over which vehicles travel, a barricade or other safeguard and a warning sign shall be placed to prevent workers from stepping directly into moving traffic.

(6) Tramways and trestles shall be substantially supported by piling or framed bent construction which shall be frequently inspected and maintained in good repair at all times. Tramways or trestles used both for vehicular and pedestrian traffic shall have a walkway with standard hand rail at the outer edge and shear timber on the inner edge, and shall provide three feet clearance to vehicles. When walkways cross over other thoroughfares, they shall be solidly

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fenced at the outer edge to a height of 42 inches over such thoroughfares.

(7) Where tramways and trestles are built over railroads they shall have a vertical clearance of twenty-two feet above the top of the rails. When constructed over carrier docks or roads, they shall have a vertical clearance of not less than six feet above the drivers foot rest on the carrier, and in no event shall this clearance be less than twelve feet from the surface of the lower roadway or dock.

(8) Walkways (either temporary or permanent) shall be not less than twenty-four inches wide and two inches thick, nominal size, securely fastened at each end. When such walkways are used on an incline the angle shall not be greater than twenty degrees from horizontal.

(9) Walkways from the shore or dock to floats or barges shall be securely fastened at the shore end only and clear space provided for the other end to adjust itself to the height of the water.

(10) Cleats of one by four inch material shall be fastened securely across walkways at uniform intervals of eighteen inches whenever the grade is sufficient to create a slipping hazard.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71011, filed 8/27/81.]

WAC 296-78-71013 Cableways. (1)(a) Inclined cableways shall have a central line between the rails in practical alignment with the center of the hoisting drums. A substantial bumper shall be installed at the foot of each incline.

(b) Barricades or warning signs shall be installed to warn pedestrians to stand clear of the cables on inclined cableways. The cables shall not be put into motion without activating an alarm system, either audible or visible, which will inform anyone on the tracks to stand clear.

(2) Employees shall not ride on or stand below the cars on an inclined cableway.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71013, filed 8/27/81.]

WAC 296-78-71015 Tanks and chemicals. (1) All open vats and tanks into which workers may fall shall be guarded with standard railings or screen guards in all cases where such guarding is possible with regard to practical operation.

(2) Foundations of elevated tanks shall be accessible for inspections. When the tank platform is more than five feet above the ground a stairway or ladder shall be permanently attached.

(3) Every open tank over five feet in height shall be equipped with fixed standard ladders both inside and out, extending from the bottom to the rim of the tank arranged to be accessible to each other, so far as local conditions permit.

(4) The use of chemicals for treating of lumber for prevention of sap stain or mold or as preservatives, shall conform to the requirements of WAC 296-62-11021, open surface tanks.

(a) Storage, handling, and use of chemicals. Threshold limits. Employees shall not be exposed to airborne concentration of toxic dusts, vapors, mists or gases that exceed the threshold limit values set forth in chapter 296-24 WAC, Part

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A-2, general safety and health standards, and chapter 296-62 WAC, Part E, general occupational health standards.

(b) Protective equipment. The use of chemicals shall be controlled so as to protect employees from harmful exposure to toxic materials. Where necessary, employees shall be provided with and required to wear such protective equipment as will afford adequate protection against harmful exposure as required by chapter 296-24 WAC, Part A-2, general safety and health standards, and chapter 296-62 WAC, Part E, general occupational health standards.

(5)(a) Means shall be provided and used to collect any excess of chemicals used in treating lumber so as to protect workers from accidental contact with harmful concentrations of toxic chemicals or fumes.

(b) Dip tanks containing flammable or combustible liquids shall be constructed, maintained and used in accordance with WAC 296-24-405 of the general safety and health standards.

(c) An evacuation plan shall be developed and implemented for all employees working in the vicinity of dip tanks using flammable and/or combustible liquids. A copy of the plan shall be available at the establishment for inspection at all times. Every employee shall be made aware of the evacuation plan and know what to do in the event of an emergency and be evacuated in accordance with the plan. The plan shall be reviewed with employees at least quarterly and documented.

(d) When automatic foam, automatic carbon dioxide or automatic dry chemical extinguishing systems are used, an alarm device shall be activated to alert employees in the dip tank area before and during the activation of the system. The following combinations of extinguishment systems when used in conjunction with the evacuation plan as stated above will be acceptable in lieu of bottom drains:

(i) A dip tank cover with an automatic foam extinguishing system under the cover, or an automatic carbon dioxide system, or an automatic dry chemical extinguishing system, or an automatic water spray extinguishing system;

(ii) An automatic dry chemical extinguishing system with an automatic carbon dioxide system or a second automatic dry chemical extinguishing system or an automatic foam extinguishing system;

(iii) An automatic carbon dioxide system with a second automatic carbon dioxide system or an automatic foam extinguishing system.

(e) The automatic water spray extinguishing systems, automatic foam extinguishing systems, and dip tank covers shall conform with the requirements of WAC 296-24-405. The automatic carbon dioxide systems and dry chemical extinguishing system shall conform with the requirements of WAC 296-24-615 and 296-24-620.

(6) Where workers are engaged in the treating of lumber with chemicals or are required to handle lumber or other materials so treated, the workers shall be provided with, at no cost to the worker, and required to use such protective equipment as will provide complete protection against contact with toxic chemicals or fumes therefrom.

(7) Sanitation requirements. The requirements of WAC 296-24-120 through 296-24-13013 of the general safety and health standards, shall govern sanitation practices.

(8) The sides of steam vats and soaking pits unless otherwise guarded shall extend forty-two inches above the floor level. The floor adjacent thereto shall be of nonslip construction.

(9) Large steam vats or soaking pits, divided into sections, shall be provided with substantial walkways between each section, each walkway to be provided with standard railings which may be removable if necessary.

(10) Covers shall be removed only from that portion of the steaming vats on which workers are working and a portable railing shall be placed at this point to protect the operators.

(11) Workers shall not ride or step on logs in steam vats.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-71015, filed 8/20/96, effective 10/15/96; 94-20-057 (Order 94-16), § 296-78-71015, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71015, filed 8/27/81.]

WAC 296-78-71017 Dry kilns. (1) Dry kilns shall be so constructed upon solid foundations that tracks will not sag. Dry kilns shall be provided with suitable walkways. Each kiln shall have doors that operate from the inside and be provided with escape doors of adequate height and width to accommodate an average size man, that also operates from the inside, and shall be located in or near the main door. Escape doors shall swing in the direction of exit. Kiln doors and door carriers shall be fitted with safety devices to prevent the doors or carriers from falling.

(2) Ladders. A fixed ladder, in accordance with the requirements of WAC 296-24-810 through 296-24-81013 of the general safety and health standards, or other means shall be provided to permit access to the roof. Where controls and machinery are mounted on the roof, a permanent stairway with standard handrail shall be installed in accordance with the requirements of WAC 296-24-765 through 296-24-76523 of the general safety and health standards.

(3) A heated room shall be provided for the use of the kiln operator in inclement weather. He should remain in such room for at least ten minutes after leaving a hot kiln before going to cold outside air.

(4) Where operating pits are used, they shall be well ventilated, drained and lighted. Substantial gratings shall be installed at the kiln floor line. Steam lines shall be provided with insulation wherever exposed to contact by employees. Fans shall be enclosed by standard safeguards.

(5) Mechanical equipment. All belts, pulleys, blowers, and other exposed moving equipment used in or about kilns shall be guarded in accordance with the requirements of WAC 296-24-205 through 296-24-20533 of the general safety and health standards.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-71017, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71017, filed 8/27/81.]

WAC 296-78-71019 Exhaust systems. (1) Air requirements in buildings, where persons are habitually employed, shall meet the requirements of the general occupational health standard, WAC 296-62-100 through 296-62-11013.

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(2) Where the natural ventilation is not sufficient to remove dust, fumes or vapors that create or constitute a hazard, additional means of removal shall be provided.

(3) All mills containing one or more machines whose operations create dust, shavings, chips or slivers during a period of time equal to or greater than one-fourth of the working day or shift, shall be equipped with a collecting system either continuous or automatic in action and of sufficient strength and capacity to thoroughly remove such refuse from the points of operation of the machines and the work areas.

(4) Each woodworking machine that creates dust, shavings, chips, or slivers shall be equipped with an exhaust or conveyor system located and adjusted to remove the maximum amount of refuse from the point of operation and immediate vicinity.

(5) Blower, collecting and exhaust systems shall be designed, constructed and maintained in accordance with American National Standards Z33.1 - 1961 (for the installation of blower and exhaust systems for dust, stock and vapor removal or conveying) and Z12.2 - 1962 (R1969) (code for the prevention of dust explosions in woodworking and wood flour manufacturing plants).

(6) Fans used for ventilating shall be of ample capacity, as evidenced by the performance schedules of the manufacturers, and shall be guarded when exposed to contact. Hoods, dust conveyors, dust collectors and other accessory equipment shall be large enough to insure free intake and discharge.

(7) The outlet or discharge of all ventilating equipment shall be so arranged that at no time will the dust, vapors, gases or other air borne impurities discharged, create or constitute a hazard.

(8) Where a hood is used to form a part or all of the guard required on a given machine, it shall be constructed of not less than ten U.S. gauge sheet metal, or if of cast iron it shall be not less than three-sixteenths inches in thickness.

(9) All exhaust pipes shall be of such construction and internal dimensions as to minimize the possibility of clogging. They shall be readily accessible for cleaning.

(10) All exhaust pipes shall empty into settling or dust chambers which shall effectively prevent the dust or refuse from entering any work area. Such settling or dust chambers shall be so designed and operated as to reduce to a minimum the danger of fire or dust explosions.

(11) In lieu of a general ventilating system, exhaust or blower units may be installed on the dust or fume producing machine, provided the required protection is secured thereby.

(12) When proper ventilation is not provided, and temporary hazardous conditions are therefore encountered, the employer shall furnish approved respiratory and visual equipment: Provided, however, That the exposure to such hazard shall not be for more than two hours duration. Protective measures and equipment shall meet the requirements of the general occupational health standard, chapter 296-62 WAC, Part E and the requirements of the general safety and health standard, WAC 296-24-081 through 296-24-08113.

(13) Provisions for the daily removal of refuse shall be made in all operations not required to have an exhaust system, or having refuse too heavy, or bulky, or otherwise unsuitable to be handled by an exhaust system.

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[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-10-071, § 296-78-71019, filed 5/4/99, effective 9/1/99. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71019, filed 8/27/81.]

WAC 296-78-71021 Spray painting. All spray painting operations shall be carried on in accordance with the requirements of the general safety and health standard, WAC 296-24-370 through 296-24-37027 and the general occupational health standard, WAC 296-62-11019.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71021, filed 8/27/81.]

WAC 296-78-71023 Lighting. The lighting and illumination requirements of the general occupational health standards, WAC 296-62-09003, shall apply.

[Statutory Authority: RCW 49.17.040 and 49.17.050. 82-13-045 (Order 82-22), § 296-78-71023, filed 6/11/82. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71023, filed 8/27/81.]

WAC 296-78-71025 Gas piping and appliances. All gas piping and appliances shall be installed in accordance with the American National Standard Requirements for Gas Appliances and Gas Piping Installations, Z21.30 - 1964.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71025, filed 8/27/81.]

WAC 296-78-715 Mechanical, steam and electrical equipment.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-715, filed 8/27/81.]

WAC 296-78-71501 General provisions. (1) All machinery or other equipment located or used on the premises of the operation or in the processes incidental thereto, shall be provided and maintained with approved standard safeguards, irrespective of ownership.

(2) Machines shall be so located that each operator will have sufficient space in which to handle material with the least possible interference from or to other workers or machines.

(3) Machines shall be so placed that it will not be necessary for the operator to stand where passing traffic creates a hazard.

(4) Aisles of sufficient width to permit the passing of vehicles or employees without crowding shall be provided in all work areas and stock or storage rooms.

(5) All metal decking around machinery shall be equipped to effectively prevent slipping.

(6) All machinery or equipment started by a control so located as to create impaired vision of any part of such machinery or equipment shall be provided with an audible warning device, where such machinery or equipment is exposed to contact at points not visible to the operator. Such devices shall be sounded before starting up unless positive mechanical or electrical interlocking controls are provided which will prevent starting until all such posts are cleared.

(7) A mechanical or electrical power control device shall be provided at each machine which will make it possible for

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the operator to stop the machine feed without leaving his position at the point of operation.

(8) All machines operated by means of treadles, levers, or other similar devices, shall be provided with positive and approved nonrepeat devices except where such machine is being used as an automatic repeating device.

(9) Operating levers and treadles on all machines or machinery shall be so located and protected that they cannot be shifted or tripped accidentally.

(10) All power driven machinery shall be stopped and brought to a complete standstill before any repairs or adjustments are made or pieces of material or refuse removed, except where motion is necessary to make adjustments.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71501, filed 8/27/81.]

WAC 296-78-71503 Lock out—Tag out. (1) To avoid accidental activation of machinery, electrical devices or other equipment which could create a hazardous condition while performing maintenance, repair, cleanup or construction work, the main disconnect(s) (line circuit breakers) shall first be locked out and tagged in accordance with the following provisions:

(2) Effective date. Effective July 1, 1982, only padlocks or other equivalent protective devices shall be used for locking out the main disconnect(s) (line circuit breakers) of machinery, electrical devices or other equipment that is shut down while maintenance, repair, cleanup, construction work or other type of work is done to the equipment. Tags shall be used to supplement the padlocks or other equivalent protective devices, and shall be used only for informational purposes.

(3) Padlocks, tags or equivalent protective devices to be supplied. The employer shall supply and the employee(s) shall use as many padlocks or other equivalent protective devices as are necessary to effectively lock out all affected equipment.

(4) Lock out plan. An effective lock out plan shall be formulated in writing and all concerned employees so informed. The plan shall contain specific procedures for locking out equipment, information to be contained on supplemental tags and specific procedures for unlocking equipment after repairs, cleanup, etc., have been completed.

(5) Informational tags. Tags used for providing supplemental information with lock out padlocks or other equivalent protective devices shall contain the name of the person authorizing placement, reason for placing, date, signature of person placing tag and such other relative information as deemed necessary by the person placing the tag.

(6) Lock out by pushbutton only. Locking out a machine or item of equipment by use of a pushbutton or other local control device only will not be acceptable as meeting the intent of these rules.

(7) Coordination of locking out devices. When repair, adjustment, cleanup, maintenance or construction work is necessary and the lock out procedures must be followed by any person not familiar with all power sources or material entry sources to any area involved, that person shall consult with the operator, supervisor, or some person that is capable

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of informing him of proper lock out procedures and supplemental tagging information.

(8) Lock out before removing guards. Equipment shall be stopped and locked out before employees remove guards or reach into any potentially hazardous area. The only exception to this rule will be when equipment must be in motion in order to make proper adjustments.

(9) Removal of lock outs. Each person actively engaged in the repair, maintenance, cleanup, etc., shall lock out the affected equipment and place the informational tag. Upon completion of the work and reinstallation of the guards, that person shall personally remove his lock and tag, except when it is positively determined that an employee has left the premises without removing his lock and tag, other persons may remove the locks and tags in accordance with a procedure formulated by each firm and approved by the division of industrial safety and health.

(10) Valves to be locked and tagged out. Each valve used to control the flow of hazardous materials into, or used to activate the equipment being worked on, shall be locked and tagged out.

(11) Piping systems deactivated. Prior to working on piping systems containing pressurized or hazardous materials, the valve(s) controlling the flow to the affected area shall be locked and tagged out. The piping in the area to be worked on shall be drained and purged, if needed. If the piping contains hazardous materials, the piping shall be isolated from the work area by the insertion of blank flanges in the piping system.

(12) Pipe lines without valves. If pipelines or ducts are constructed without valves or closures that can be locked out, the lines or ducts shall be broken at a flange and a blank flange inserted to stop accidental flow of any hazardous material.

(13) Testing after lock out. After locking out and tagging equipment, a test shall be conducted to ascertain that the equipment has been made inoperative or the flow of hazardous material has been positively stopped. Precautions shall be taken to ascertain that persons will not be subjected to hazard while conducting the test if power source or flow of material is not shut off.

(14) Temporary or alternate power to be avoided. Whenever possible, temporary or alternate sources of power to the equipment being worked on shall be avoided. If the use of such power is necessary, all affected employees shall be informed and the source of temporary or alternate power shall be identified.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71503, filed 8/27/81.]

WAC 296-78-71505 Mechanical power transmission apparatus. (1) Machines and other equipment shall not be oiled while in motion, unless provided with guards or other devices to permit oiling without any possibility of contact with moving parts of machinery.

(2) Inspections shall be made to assure that shaftings, bearings and machines are in proper alignment at all times and that bolts in shaft hangars, couplings and boxes are tight.

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(3) Isolated bearings or other equipment not reached by walkway shall be served by a ladder or other means of safe access.

(4) Running belts under power on or off pulleys shall be accomplished by mechanical means which will not expose employees to moving elements of the operation.

(5) Counterweights located on or near passageways or work areas shall be provided with enclosures. Overhead counterweights shall be provided with substantial safety chains or cables, or otherwise secured against falling.

(6) The construction, operation, and maintenance of all mechanical power-transmission apparatus shall be in accordance with the requirements of WAC 296-24-205 through 296-24-20533 of the general safety and health standard.

(7) Baffles shall be erected, where necessary, to protect employees from breaking belts, chains, ropes or cables.

(8) Overhead horizontal belts, chains or rope drives shall be provided with guards.

(9) Hydraulic systems. Means shall be provided to block, chain, or otherwise secure equipment normally supported by hydraulic pressure so as to provide for safe maintenance.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-71505, filed 8/27/81.]

WAC 296-78-720 Boiler and pressure vessels. Boilers and pressure vessels shall be constructed, maintained and inspected in accordance with the provisions of the boiler and unfired pressure vessel law, chapter 70.79 RCW, and chapter 296-104 WAC as administered by the boiler inspection section of the department of labor and industries.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-720, filed 8/27/81.]

WAC 296-78-725 Nonionizing radiation. (1) Only qualified and trained employees shall be assigned to install, operate, adjust, and maintain laser equipment. Proof of qualification of the laser equipment operator shall be available and in possession of operator at all times.

(2) Employees, when working in areas in which a potentially hazardous exposure (see WAC 296-62-09005(4)) to direct or reflected laser radiation exists, shall be provided with antilaser eye protection devices specified in WAC 296-62-09005, general occupational health standards.

(3) Areas in which lasers are used shall be posted with standard laser warning placards.

(4) Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended for a substantial period of time, such as during lunch hour, overnight, or at change of shifts, the laser shall be turned off or shutters or caps shall be utilized.

(5) The laser beam shall not be directed at employees.

(6) Only mechanical or electronic means shall be used as a detector for guiding the internal alignment of the laser.

(7) The laser equipment shall bear such labels, logos and data placards to indicate maximum output and class designation as required of the manufacturer at time of sale, by I.A.W. Part 1040, CFR Title 21. Such labels, logos, data placards, etc., shall be maintained in a legible condition.

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(8) When it is raining or snowing, or when there is dust or fog in the air, and it is impracticable to cease laser system operation, employees shall be kept out of range of the area of source and target during such weather conditions.

(9) Employees shall not be exposed to light intensities in excess of:

(a) Direct staring: One micro-watt per square centimeter;

(b) Incidental observing: One milliwatt per square centimeter;

(c) Diffused reflected light: Two and one-half watts per square centimeter.

(10) The laser equipment shall not be modified except by the manufacturer.

(11) Laser unit in operation shall be set up above the heads of the employees, when possible.

(12) Employees shall not be exposed to radio frequency/microwave radiation in excess of the permissible exposure limits specified in WAC 296-62-09005.

[Statutory Authority: Chapter 49.17 RCW, 96-17-056, § 296-78-725, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-725, filed 8/27/81.]

WAC 296-78-730 Electrical service and equipment.

(1) Electrical service and equipment shall be constructed, maintained, inspected and operated according to chapter 296-24 WAC, General safety and health standards, Part L.

(2) Repairs. Electrical repairs shall be made only by authorized and qualified personnel.

(3) Identification. Marks of identification on electrical equipment shall be clearly visible.

(4) Protective equipment. Rubber protective equipment shall be provided as required by WAC 296-24-092(1) of the general safety and health standard.

(5) Open switches. Before working on electrical equipment, switches shall be open and shall be locked out.

(6) Concealed conductors. Where electrical conductors are known to be concealed, no work shall be performed until such conductors are located.

(7) Overload relays. Overload relays shall be reset by authorized qualified personnel only.

(8) Passageways to panels. Passageways to switch centers or panels shall at all times be kept free from obstruction. Not less than three feet of clear space shall be maintained in front of switch centers or panels at all times.

(9) Bridging fuses. Fuses shall not be doubled or bridged.

[Statutory Authority: Chapter 49.17 RCW, 91-24-017 (Order 91-07), § 296-78-730, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-730, filed 8/27/81.]

WAC 296-78-735 Elevators, moving walks. Elevators, moving walks and other lifting devices intended for either passenger or freight service shall be constructed, maintained, inspected and operated in accordance with the provisions of chapter 70.87 RCW, WAC 296-24-870 through 296-24-90009 of the general safety and health standards, and those specific standards which are applicable from the division of

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building and construction safety inspection services, elevator section.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-735, filed 8/27/81.]

WAC 296-78-740 Transportation—Lumber handling equipment—Cranes—Construction. (1) All apparatus shall be designed throughout, with not less than the following factors of safety, under static full rated load stresses, based on ultimate strength of the material used:

Material	Factor of Safety
Cast iron	12
Cast steel.	8
Structural steel	5
Forged steel.	5
Cables	5

(2) A notice shall be placed on every crane and hoist showing the maximum allowable load in pounds or tons. This notice shall be placed in such a manner as to be clearly legible from the floor.

(3) Cranes shall be of what is known as "all steel construction." No cast iron shall be used in parts subject to tension except in drums, trolley sides, bearings, brackets and brake shoes.

(4) The construction of cranes shall be such that all parts may be safely lubricated and inspected when cranes are not in operation.

(5) Bolts subject to stress shall be of the through type and all bolts shall be equipped with approved protection so that the bolt will not work loose or nuts work off.

(6) Outside crane cages shall be enclosed. There shall be windows on three sides of the cage and windows in the front, and the side opposite the door shall be the full width of the cage.

(7) Where a tool box or receptacle is used for the storing of oil cans, tools, etc., it shall be permanently secured in the cage or on the foot-walk of outside cranes and on the foot-walk of inside cranes. Tool boxes of hot metal cranes shall be constructed of metal.

(8) All gears on cranes shall be provided with standard guards.

(9) Keys projecting from revolving shafts shall be guarded.

(10) A braking apparatus shall be provided on every type of crane and shall be so designed and installed as to be capable of effectually braking a weight of at least one and one-half times the full rated load.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-740, filed 8/27/81.]

WAC 296-78-745 Electrical equipment. (1) All exposed current-carrying parts except conductors, connected to circuits above three hundred volts to ground shall be so isolated, insulated, or guarded that no employee can come in contact with them. Exposed parts less than 300 volts shall be protected in some suitable way against possible accidental contact. Exposed metallic parts of conduit armored cable or molding shall be permanently grounded.

(2) Guards for the current-carrying parts of unisolated electrical equipment, such as controllers, motors, transformers, automatic cutouts, circuit breakers, switches, and other devices shall consist of cabinets, casings, or shields of permanently grounded metal or of insulating material.

(3) All parts of electrical equipment, such as fuses and the handles and arc chutes of circuit breakers, shall be so isolated or guarded that the liability of employees being struck or burned by sparking, flashing or movement during operation is reduced to a minimum.

(4) All exposed noncurrent carrying metal parts of electrical equipment shall be permanently grounded. The ground connection through well bonded track rails will be considered satisfactory.

(5) The metallic parts of portable cranes, derricks, hoists, and similar equipment on which wires, cables, chains, or other conducting objects are maintained shall be provided with an effective protective ground, where operated in the vicinity of supply lines.

(6) Readily accessible means shall be provided whereby all conductors and equipment located in cranes can be disconnected entirely from the source of energy at a point as near as possible to the main current collectors.

(7) Means shall be provided to prevent the starting and operation of equipment by unauthorized persons.

(8) The control levers of traveling cranes shall be so located that the operator can readily face the direction of travel.

(9) A hoist limiting device shall be provided for each hoist.

(10) All fuses shall be of the enclosed arcless type.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-745, filed 8/27/81.]

WAC 296-78-750 Chains, wire rope, cables and fiber rope. (1) Ropes, cables, slings, and chains.

(a) Safe usage. Ropes, cables, slings, and chains shall be used in accordance with safe use practices recommended by the manufacturer or within safe limits recommended by the equipment manufacturer when used in conjunction with it.

Work by qualified persons. Installation, inspection, maintenance, repair, and testing of ropes, cables, slings, and chains shall be done only by persons qualified to do such work.

(b) Proof testing. The employer shall ensure that before use, each new, repaired, or reconditioned alloy steel chain sling, including all welded components in the sling assembly, shall be proof tested by the sling manufacturer or equivalent entity, in accordance with paragraph 5.2 of the American Society of Testing and Materials Specification A391.65 (ANSI G61.1-1968). The employer shall retain the certificate of the proof test and shall make it available for examination. When a chain sling assembly is made up of segments of proof tested alloy chain and proof tested individual components such as mechanical coupling links, hooks and similar devices; it is not necessary to test the assembled unit, when appropriate test certification of individual components is available and the assembled sling is appropriately tagged by the manufacturer or equal entity. The sling shall not be used in excess of the rated capacity of the weakest component.

(c) Slings. Slings and their fittings and fastenings, when in use, shall be inspected daily for evidence of overloading, excessive wear, or damage. Slings found to be defective shall be removed from service.

(2) Proper storage shall be provided for slings while not in use.

(3) Protection shall be provided between the sling and sharp unyielding surfaces of the load to be lifted.

(4) Hooks. No open hook shall be used in rigging to lift any load where there is hazard from relieving the tension on the hook from the load or hook catching or fouling.

(5) Ropes or cables. Wire rope or cable shall be inspected when installed and once each day thereafter, when in use. It shall be removed from hoisting or load-carrying service when kinked or when one of the following conditions exist:

(a) When three broken wires are found in one lay of 6 by 6 wire rope.

(b) When six broken wires are found in one lay of 6 by 19 wire rope.

(c) When nine broken wires are found in one lay of 6 by 37 wire rope.

(d) When eight broken wires are found in one lay of 8 by 19 wire rope.

(e) When marked corrosion appears.

(f) Wire rope of a type not described herein shall be removed from service when four percent of the total number of wires composing such rope are found to be broken in one lay.

(g) Condemned. When wire rope, slings or cables deteriorate through rust, wear, broken wires, kinking or other conditions, to the extent there is a reasonable doubt that the necessary safety factor is maintained, the use of such equipment shall be discontinued.

(6) Wire rope removed from service due to defects shall be plainly marked or identified as being unfit for further use on cranes, hoists, and other load-carrying devices.

(7) The ratio between the rope diameter and the drum, block, sheave, or pulley tread diameter shall be such that the rope will adjust itself to the bend without excessive wear, deformation, or injury. In no case shall the safe value of drums, blocks, sheaves, or pulleys be reduced when replacing such items unless compensating changes are made for rope used and for safe loading limits.

(8) Drums, sheaves, and pulleys. Drums, sheaves, and pulleys shall be smooth and free from surface defects liable to injure rope. Drums, sheaves, or pulleys having eccentric bores or cracked hubs, spokes, or flanges shall be removed from service.

(9) Connections. Connections, fittings, fastenings, and other parts used in connection with ropes and cables shall be of the quality, size and strength recommended by the manufacturer for the use intended. These connections shall be installed in accordance with the manufacturer's recommendations.

(10) Socketing, splicing, and seizing.

(a) Socketing, splicing, and seizing of cables shall be performed only by qualified persons.

(b) All eye splices shall be made in a manner recommended by the manufacturer and wire rope thimbles of

proper size shall be fitted in the eye, except that in slings the use of thimbles shall be optional.

(11) Wire rope clips attached with U-bolts shall have these bolts on the dead or short end of the rope. The U-bolt nuts shall be retightened immediately after initial load carrying use and at frequent intervals thereafter. The number and spacing of clips shall be as follows:

Improved Plow Steel Diameter of Rope	Number of Clips (Drop Forged)	Required Other Material	Minimum Space Between Clips
3/8 to 5/8"	3	4	3-3/4"
3/4"	4	5	4-1/2"
7/8"	4	5	5-1/4"
1 "	5	6	6 "
1-1/8"	6	6	6-3/4"
1-1/4"	6	7	7-1/2"
1-3/8"	7	7	8-1/4"
1-1/2"	7	8	9 "

(a) When a wedge socket-type fastening is used, the dead or short end of the cable shall be clipped with a U-bolt or otherwise made secure against loosening.

(b) Fittings. Hooks, shackles, rings, pad eyes, and other fittings that show excessive wear or that have been bent, twisted, or otherwise damaged shall be removed from service.

(12) Running lines. Running lines of hoisting equipment located within six feet six inches of the ground or working level shall be boxed off or otherwise guarded, or the operating area shall be restricted.

(13) Preventing abrasion. The reeving of a rope shall be so arranged as to minimize chafing or abrading while in use.

(14) Sheave guards. Bottom sheaves shall be protected by close fitting guards to prevent cable from jumping the sheave.

(15) There shall be not less than two full wraps of hoisting cable on the drums of cranes and hoists at all times of operation.

(16) Where the cables are allowed to pile on the drums of cranes, the drums shall have a flange at each end to prevent the cables from slipping off the drum.

(17) Chains. Chains used in load carrying service shall be inspected before initial use and weekly thereafter.

If at any time any three-foot length of chain is found to have stretched one-third the length of a link it shall be discarded.

(18) Chains shall be spliced in compliance with the requirements of the general safety and health standard, WAC 296-24-29413.

(19) Wherever annealing of chains is attempted, it shall be done in properly equipped annealing furnaces and under the direct supervision of a competent person thoroughly versed in heat treating.

Chain shall be normalized or annealed periodically as recommended by the manufacturer.

(20) Fiber rope.

(a) Frozen fiber rope shall not be used in load carrying service.

(b) Fiber rope that has been subjected to acid shall not be used for load carrying purposes.

(c) Fiber rope shall be protected from abrasion by padding where it is fastened or drawn over square corners or sharp or rough surfaces.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-750, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-750, filed 8/27/81.]

WAC 296-78-755 Natural and synthetic fiber rope slings. (1) Sling use.

(a) Fiber rope slings made from conventional three strand construction fiber rope shall not be used with loads in excess of the rated capacities prescribed in Tables D-16 through D-19 of Part "D" of the general safety and health standards, chapter 296-24 WAC.

(b) Slings not included in these tables shall be used only in accordance with the manufacturer's recommendations.

(2) Safe operating temperatures. Natural and synthetic fiber rope slings, except for wet frozen slings, may be used in a temperature range from minus 20°F to plus 180°F without decreasing the working load limit. For operations outside this temperature range and for wet frozen slings, the sling manufacturer's recommendations shall be followed.

(3) Splicing. Spliced fiber rope slings shall not be used unless they have been spliced in accordance with the following minimum requirements and in accordance with any additional recommendations of the manufacturer:

(a) In manila rope, eye splices shall consist of at least three full tucks, and short splices shall consist of at least six full tucks, three on each side of the splice center line.

(b) In synthetic fiber rope, eye splices shall consist of at least four full tucks, and short splices shall consist of at least eight full tucks, four on each side of the center line.

(c) Strand end tails shall not be trimmed flush with the surface of the rope immediately adjacent to the full tucks. This applies to all types of fiber rope and both eye and short splices. For fiber rope under one inch in diameter, the tail shall project at least six rope diameters beyond the last full tuck. For fiber rope one inch in diameter and larger, the tail shall project at least six inches beyond the last full tuck. Where a projecting tail interferes with the use of the sling, the tail shall be tapered and spliced into the body of the rope using at least two additional tucks (which will require a tail length of approximately six rope diameters beyond the last full tuck).

(d) Fiber rope slings shall have a minimum clear length of rope between eye splices equal to ten times the rope diameter.

(e) Knots shall not be used in lieu of splices.

(f) Clamps not designed specifically for fiber ropes shall not be used for splicing.

(g) For all eye splices, the eye shall be of such size to provide an included angle of not greater than sixty degrees at the splice when the eye is placed over the load or support.

(4) End attachments. Fiber rope slings shall not be used if end attachments in contact with the rope have sharp edges or projections.

(5) Removal from service. Natural and synthetic fiber rope slings shall be immediately removed from service if any of the following conditions are present:

- (a) Abnormal wear.
- (b) Powdered fiber between strands.
- (c) Broken or cut fibers.
- (d) Variations in the size or roundness of strands.
- (e) Discoloration or rotting.
- (f) Distortion of hardware in the sling.
- (6) Repairs. Only fiber rope slings made from new rope shall be used. Use of repaired or reconditioned fiber rope slings is prohibited.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-755, filed 8/27/81.]

WAC 296-78-760 Synthetic web slings. (1) Sling identification. Each sling shall be marked or coded to show the rated capacities for each type of hitch and type of synthetic web material.

(2) Webbing. Synthetic webbing shall be of uniform thickness and width and selvage edges shall not be split from the webbing's width.

(3) Fittings. Fittings shall be:

- (a) Of a minimum breaking strength equal to that of the sling; and
- (b) Free of all sharp edges that could in any way damage the webbing.

(4) Attachment of end fittings to webbing and formation of eyes. Stitching shall be the only method used to attach end fittings to webbing and to form eyes. The thread shall be in an even pattern and contain a sufficient number of stitches to develop the full breaking strength of the sling.

(5) Sling use. Synthetic web slings illustrated in Figure D-6 shall not be used with loads in excess of the rated capacities specified in Tables D-20 through D-22. Slings not included in these tables shall be used only in accordance with the manufacturer's recommendations.

(6) Environmental conditions. When synthetic web slings are used, the following precautions shall be taken:

(a) Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present.

(b) Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

(c) Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

(7) Safe operating temperatures. Synthetic web slings of polyester and nylon shall not be used at temperatures in excess of 180°F. Polypropylene web slings shall not be used at temperatures in excess of 200°F.

(8) Repairs.

(a) Synthetic web slings which are repaired shall not be used unless repaired by a sling manufacturer or an equivalent entity.

(b) Each repaired sling shall be proof tested by the manufacturer or equivalent entity to twice the rated capacity prior to its return to service. The employer shall retain a certificate of the proof test and make it available for examination.

(c) Slings, including webbing and fittings, which have been repaired in a temporary manner shall not be used.

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(9) Removal from service. Synthetic web slings shall be immediately removed from service if any of the following conditions are present:

- (a) Acid or caustic burns;
- (b) Melting or charring of any part of the sling surface;
- (c) Snags, punctures, tears or cuts;
- (d) Broken or worn stitches; or
- (e) Distortion of fittings.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-760, filed 8/27/81.]

WAC 296-78-765 Floor operated cranes. (1) An unobstructed aisle not less than three feet wide shall be maintained for travel of the operator except in such cases where the control handles are hung from the trolleys of traveling cranes.

(2) The controller or controllers, if rope operated, shall automatically return to the "off" position when released by the operator.

(3) Pushbuttons, in pendant stations, shall return to the "off" position when pressure is released by the crane operator.

(4) All pushbuttons shall be marked to indicate their purpose.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-765, filed 8/27/81.]

WAC 296-78-770 Operators. (1) Cranes shall be operated only by regular crane operators, authorized substitutes who have had adequate experience and training under the supervision of a competent operator, or by crane repair person or inspectors.

(2) No person under the age of eighteen years shall be permitted to operate a crane.

(3) Operators shall be required to pass a practical examination limited to the specific type of equipment to be operated. Operators shall meet the following physical qualifications:

(a) Have vision of at least 20/30 Snellen in one eye, and 20/50 in the other, with or without corrective lenses.

(b) Be able to distinguish red, green, and yellow, regardless of position of colors, if color differentiation is required for operation.

(c) Hearing, with or without hearing aid, must be adequate for the specific operation.

(d) A history of epilepsy or an uncorrected disabling heart condition shall be cause for a doctor decision to determine qualifications to operate a crane.

(4) Hands shall be kept free when going up and down ladders. Articles which are too large to go into pockets or belts shall be lifted to or lowered from the crane by hand line. (Except where stairways are provided.)

(5) Cages shall be kept free of clothing and other personal belongings. Tools, extra fuses, oil cans, waste and other articles necessary in the crane cage shall be stored in a tool box and not left loose on or about the crane.

(6) The operator shall familiarize himself fully with all crane rules and with the crane mechanism and its proper care. If adjustments or repairs are necessary, he shall report the same at once to the proper authority.

(7) The operator shall not eat, smoke or read while actually engaged in the operation of the crane.

(8) The operator or someone especially designated shall lubricate all working parts of the crane.

(9) Cranes shall be examined for loose parts or defects each day on which they are in use.

(10) Sawdust, oil or other debris shall not be allowed to accumulate to create a fire, health or slipping hazard.

(11) Operators shall avoid, as far as possible, carrying loads over workers. Loads shall not be carried over employees without sounding an audible warning alarm.

(12) Whenever the operator finds the main or emergency switch open, he shall not close it, even when starting on regular duty, until he has made sure that no one is on or about the crane. He shall not oil or repair the crane unless the main switch is open.

(13) If the power goes off, the operator shall immediately throw all controllers to "off" position until the power is again available.

(14) Before closing the main switch the operator shall make sure that all controllers are in "off" position until the power is again available.

(15) The operator shall pay special attention to the block, when long hitches are made, to avoid tripping the limit switch.

(16) The operator shall recognize signals only from the person who is supervising the lift except for emergency stop signals. Operating signals shall follow established standard crane signals as illustrated in WAC 296-78-830 of this chapter. Whistle signals may be used where one crane only is in operation. Cranes shall have audible warning device which shall be sounded in event of emergency.

(17) Before starting to hoist, the operator shall place the trolley directly over the load to avoid swinging it when being hoisted.

(18) The operator shall not make side pulls with the crane except when especially instructed to do so by the proper authority.

(19) When handling maximum loads, the operator shall test the hoist brakes after the load has been lifted a few inches. If the brakes do not hold, the load shall be lowered at once and the brakes adjusted or repaired.

(20) Bumping into runway stops or other cranes shall be avoided. When the operator is ordered to engage with or push other cranes, he shall do so with special care for the safety of persons on or below cranes.

(21) When lowering a load, the operator shall proceed carefully and make sure that he has the load under safe control.

(22) When leaving the cage the operator shall throw all controllers to "off" position and open the main switch.

(23) If the crane is located out of doors the operator shall lock the crane in a secure position to prevent it from being blown along or off the track by a severe wind.

(24) Railroad cars shall not be pulled along the tracks with sidepulls on an overhead crane.

(25) Operators shall not move the crane or a load unless floor signals are clearly understood.

(26) The rated lifting capacity of a crane shall not be exceeded. If any doubt exists about the weight of a load

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which might exceed the rated capacity, the foreman in charge must be contacted before any attempt is made to lift the load. The foreman shall determine that the load is within the rated capacity of the crane or the load shall not be lifted.

(27) Crane operators and floorpersons shall coordinate their activities on every lift or movement of the crane. Both the operator and signalperson shall clearly understand any problem a movement might create with regard to surrounding materials, structures, equipment or personnel.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-770, filed 8/27/81.]

WAC 296-78-775 Signalpersons. (1) Signalpersons shall give all the signals to the operator in accordance with established standard signals as illustrated in WAC 296-78-830 of this chapter.

(2) A designated person shall be responsible for the condition and use of all hoisting accessories and for all hitches.

(3) Before an operator moves a crane upon which an empty chain or cable sling is hanging, both ends of the sling shall be placed on the hook.

(4) Signalpersons, where necessary, shall walk ahead of the moving load and warn people to keep clear of it. They shall see that the load is carried high enough to clear all obstructions.

(5) Signalpersons shall notify the person in charge in advance when an extra heavy load is to be handled.

(6) No person shall be permitted to stand or pass under an electric magnet in use.

(7) The electrical circuit for electric magnets shall be maintained in good condition. Means for taking up the slack cable shall be provided.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-775, filed 8/27/81.]

WAC 296-78-780 Repairpersons. (1) When repairs are necessary, repairpersons shall have the crane run to a location where the repair work will least interfere with the other cranes and with operations on the floor.

(2) Before starting repairs, repairpersons shall see that all controllers are thrown to the "off" position, and that main or emergency switches are opened; one of these shall be locked out in compliance with WAC 296-78-715(11) of this chapter.

(3) Repairpersons shall immediately place warning signs or "Out of Order" signs on a crane to be repaired and also on the floor beneath or hanging from the crane so that it can easily be seen from the floor. If other cranes are operated on the same runway, repairpersons shall also place rail stops at a safe distance or make other safe provisions.

(4) When repairing runways, repairpersons shall place rail stops and warning signs or signals so as to protect both ends of the section to be repaired.

(5) Repairpersons shall take care to prevent loose parts from falling or being thrown upon the floor beneath.

(6) Repairs shall not be considered complete until all guards and safety devices have been put in place and the block and tackle and other loose material have been removed.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-780, filed 8/27/81.]

WAC 296-78-785 Construction requirements. (1)

Calculations for wind pressure on outside overhead traveling cranes shall be based on not less than 30 pounds per square foot of exposed surface.

(2) No overhung gears shall be used unless provided with an effective means of keeping them in place, and keys shall be secured to prevent gears working loose.

Safety lugs or brackets shall be provided on the trolley frames and bridge ends of overhead traveling cranes, so that in the event of a broken axle or wheel the trolley or bridge proper will not have a drop greater than one inch.

(3) Where there are no members over an outside overhead crane suitable for attaching blocks for repair work, and a locomotive crane is not available, a structural steel outrigger of sufficient strength to lift the heaviest part of the trolley shall be provided.

(4) Outside overhead traveling cranes shall be equipped with wind indicators and rail clamps as required by the general safety and health standards, WAC 296-24-23503.

(5) Foot brakes, or other effective means shall be provided to control the bridge travel of all overhead traveling cranes.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-785, filed 8/27/81.]

WAC 296-78-790 Crane platforms and footwalks. (1)

Platforms shall be provided when changing and repairing truck wheels on end trucks.

(2) A platform or footwalk shall be located on crane or crane runway to give access to the crane cage, and it shall be accessible from one or more stairways or fixed ladders. This platform or footwalk shall be not less than eighteen inches in width.

(3) Where stairways are used to give access to platforms they shall make an angle of not more than fifty degrees with the horizontal and shall be equipped with substantial railing. If ladders are used to give access to platforms they shall extend not less than thirty-six inches above the platform. Railed stairways or ladders to be used as a means of ingress and egress to crane cages shall be located at either or both ends.

(4) A footwalk shall be placed along the entire length of the bridge on the motor side, and a short platform twice the length of the trolley placed at one end of the girder on the opposite side, with a vertical clearance of a least six feet six inches where the design of crane or building permits, but in no case shall there be less than four feet clearance. For hand operated cranes the footwalk shall not be required to be installed on the bridge of the crane, but there shall be a repair platform equal in strength and design to that required for motor operated cranes, installed on the wall of the building or supported by the crane runway at a height equal to the lower edge of the bridge girder to facilitate necessary repairs.

(5) Clear width of footwalks shall not be less than eighteen inches except around the bridge motor where it may be reduced to fifteen inches.

(6) Footwalks shall be of substantial construction and rigidly braced. Footwalks for outside service shall be constructed so as to provide proper drainage, but the cracks between the boards shall not be wider than one-fourth inch.

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(7) Every footwalk shall have a standard railing and toeboard at all exposed edges. Railings and toeboards shall conform in construction and design with the following requirements:

(a) Railings shall be not less than thirty-six inches nor more than forty-two inches in height, with an additional rail midway between the top rail and the floor.

(b) Pipe railings shall be not less than one and one-fourth inch inside diameter if of iron or be not less than one and one-half inches outside diameter if of brass tubing.

(c) Metal rails other than pipe shall be at least equal in strength to that of one and one-half by three-sixteenths inch angle and shall be supported by uprights of equal strength.

(d) Posts or uprights shall be spaced not more than eight feet center to center.

(e) Toeboards shall be not less than four inches in height.

(f) Toeboards shall be constructed in a permanent and substantial manner of metal, wood, or other material equivalent thereto in strength. Where of wood, toeboards shall be at least equal in cross section to one inch by four inches; where of steel at least one-eighth inch by four inches; where of other construction at least equal to the requirements for steel. Perforations up to one-half inch are permissible in metal toeboards.

(8) No openings shall be permitted between the bridge footwalk and the crane girders. Where wire mesh is used to fill this opening the mesh openings shall be not greater than one-half inch.

(9) All footwalks and platforms shall be so designed as to be capable of sustaining a concentrated load of one hundred pounds per lineal foot.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-790, filed 8/27/81.]

WAC 296-78-795 Crane cages. (1) Safe means of escape shall be provided for operators of all cranes in all operating locations. Rope ladders shall not be used as a regular means of access but may be installed as an emergency escape device to be used in the event of fire, mechanical breakdown or other emergency.

(2) The operator's cage shall be located at a place from which signals can be clearly distinguishable, and shall be securely fastened in a place and well braced to minimize vibration. It shall be large enough to allow ample room for the control equipment and the operator. The operator shall not be required to step over an open space of more than eighteen inches when entering the cage.

(3) Cab operated cranes shall be equipped with a portable fire extinguisher which meets the requirements of the general safety and health standard, WAC 296-24-590 through 296-24-59007.

(4) In establishments where continuous loud noises prevail such as caused by the operation of pneumatic tools, steam exhausts from boilers, etc., adequate signals shall be installed on cranes or one or more employees shall be placed on the floor for each crane operated to give warning to other employees of the approach of a crane with a load. Where there are more than two cranes on the same runway or within the same building structure, signaling devices are required to

give warning to other employees of the approach of a crane with a load.

(5) Cages of cranes subjected to heat from below shall be of noncombustible construction and shall have a steel plate shield not less than one-eighth inch thick, placed not less than six inches below the bottom of the floor of the cage.

(6) Outside crane cages shall be enclosed. There shall be windows on three sides of the cage. The windows in the front and the side opposite the door shall be the full width of the cage.

(7) The floor of the cage on out-door cranes shall be extended to form an entrance landing which shall be equipped with a handrail and toeboard constructed to the specifications of WAC 296-78-790 of this chapter.

(8) A copy of the rules for operators shall be permanently posted in the cages of all cage-operated cranes.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-795, filed 8/27/81.]

WAC 296-78-800 Crane rail stops, bumpers and fenders. (1) Rail stops shall be provided at both ends of the crane runway and at ends of the crane bridge. When two trolleys are operated on the same bridge rails, bumpers shall be provided to prevent collision of trolleys.

(2) Bumpers and rail stops shall extend at least as high as the centers of the wheel.

(3) Rail stops shall be fastened to the girders or girders and rails, but not to the rails alone. This does not apply to portable rail stops. Portable rail stops shall not be used as permanent rail stops.

(4) Rail stops shall be built up of plates and angles or be made of cast steel.

(5) Fenders shall be installed which extend below the lowest point of the treads of gantry type crane wheels. They shall be of a shape and form that will tend to push or raise an employee's hand, arm or leg off the rail and away from the wheel.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-800, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-800, filed 8/27/81.]

WAC 296-78-805 Crawler locomotive and truck cranes. Crawler locomotive and truck cranes shall be constructed, maintained, inspected and operated in accordance with the provisions of WAC 296-24-240 through 296-24-24019 of the general safety and health standards.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-805, filed 8/27/81.]

WAC 296-78-810 Chain and electric hoists. (1) Chain and electric hoists shall be of what is known as "all steel construction." No cast iron shall be used in parts subject to tension except drums, bearings or brake shoes.

(2) The chains shall be made of the best quality steel or iron with welded links.

(3) Chain and electric hoists shall have a factor of safety of at least five.

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(4) Chain and electric hoists shall be equipped with a device which will automatically lock the load when hoisting is stopped.

(5) Electric hoists shall be provided with a limit stop to prevent the hoist block from traveling too far in case the operating handle is not released in time.

(6) Workers shall not ride the load of any chain or electric hoist. If necessary to balance the load manually, it shall be done from a safe distance.

(7) The rated capacity of the hoist shall be posted on both the hoist and the jib or rail.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-810, filed 8/27/81.]

WAC 296-78-815 Monorail hoists. (1) No attempt shall be made with a monorail hoist to lift or move an object by a side pull, unless designed for that purpose.

(2) A stop shall be provided at all switches and turntables which will prevent the trolley from running off should the switch be turned or be left in the open position.

(3) All monorail hoists operating on swivels shall be equipped with one or more safety catches which will support the load should a suspension pin fail. All trolley frames shall be safeguarded against spreading.

(4) Rail stops shall be provided at the ends of crane runways. Such rail stops shall extend at least as high as the centers of the wheels.

(5) All monorail hoists shall have the rated capacity posted on both the hoist and the rail.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-815, filed 8/27/81.]

WAC 296-78-820 Air hoists. (1) To prevent piston rod lock nuts from becoming loose and allowing rod to drop when supporting a load, lock nut shall be secured to piston rod by a castellated nut and cotter-pin.

(2) A clevis, "D" strap or other means shall be used to prevent the hoist cylinder becoming detached from the hanger.

(3) All air hoists shall have their rated capacity posted on both the hoist and the jib or rail.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-820, filed 8/27/81.]

WAC 296-78-825 Jib, pillar, and portable floor cranes, crabs, and winches. (1) Side pulls shall not be made with jib or pillar cranes. The arm or boom shall be directly over the load when making a lift.

(2) The gears of all cranes shall be enclosed, and if hand operated by means of a crab or winch, a locking dog shall be provided to hold load when the handle is released.

(3) Some form of brake or safety lowering device shall be provided on all crabs, winches, and jib cranes.

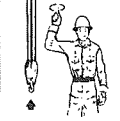
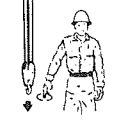
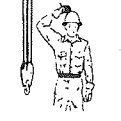

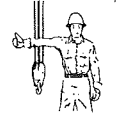
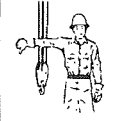
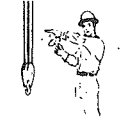
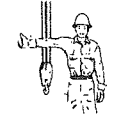
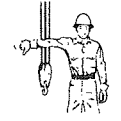
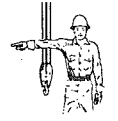
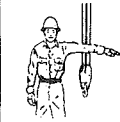
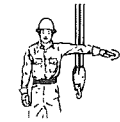
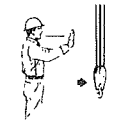
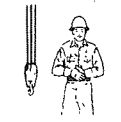
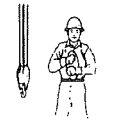


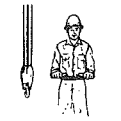


(4) A hoist limiting device shall be provided on all jib cranes of ten or more tons capacity.

(5) The rated capacity of the hoisting device shall be posted on the hoist and the arm or boom.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-825, filed 8/27/81.]

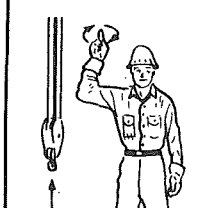
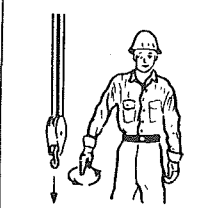
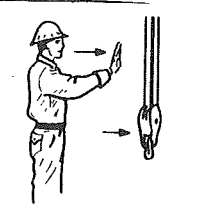
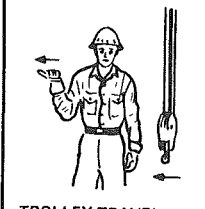
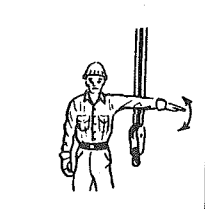
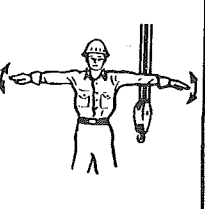
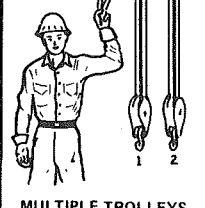
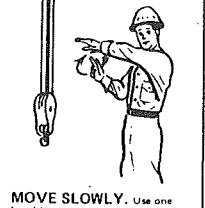
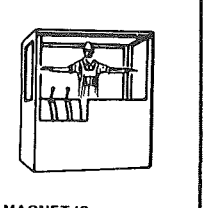
WAC 296-78-830 Standard crane hand signals—
Illustrations. (1) The following hand signals shall be used for crawler, locomotive, and truck cranes and a copy shall be posted in the cab at the operator's station.

CRAWLER, LOCOMOTIVE, AND TRUCK CRANES

 HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.	 LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circle.	 USE MAIN HOIST. Tap fist on head; then use regular signals.	 USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand; then use regular signals.	 RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.
 LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.	 MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)	 RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.	 LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.	 SWING. Arm extended, palm with finger in direction of swing of boom.
 STOP. Arm extended, palm down, hold position rigidly.	 EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.	 TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.	 DOG EVERYTHING. Clasp hands in front of body.	 TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel: forward or backward. (For crawler cranes only.)
 TRAVEL (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For crawler cranes only.)	 EXTEND BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing outward.	 RETRACT BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.	 EXTEND BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.	 RETRACT BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

(2) The following hand signals shall be used for overhead and gantry cranes and a copy shall be posted in the cab at the operator's station.

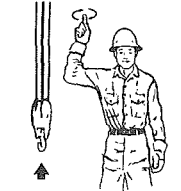
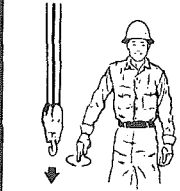
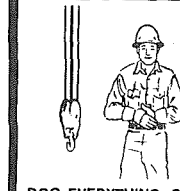
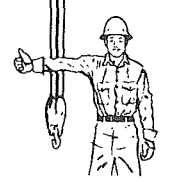
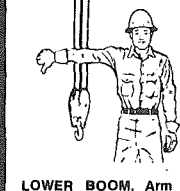
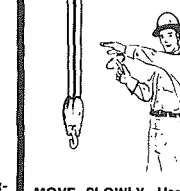
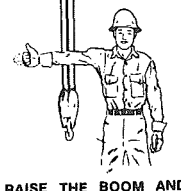
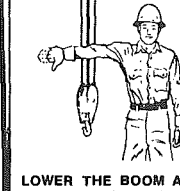
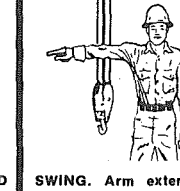
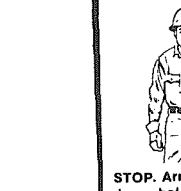
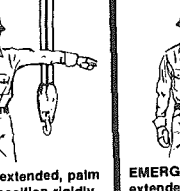
STANDARD HAND SIGNALS FOR CONTROLLING OVERHEAD AND GANTRY CRANES

 HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.	 LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circle.	 BRIDGE TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.
 TROLLEY TRAVEL. Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.	 STOP. Arm extended, palm down, move arm back and forth.	 EMERGENCY STOP. Both arms extended, palms down, move arms back and forth.
 MULTIPLE TROLLEYS. Hold up one finger for block marked "1" and two fingers for block marked "2". Regular signals follow.	 MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)	 MAGNET IS DISCONNECTED. Crane operator spreads both hands apart, palms up.

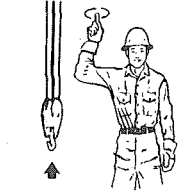
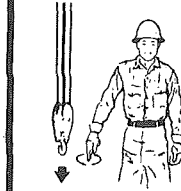
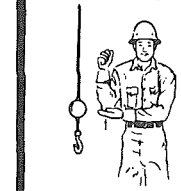
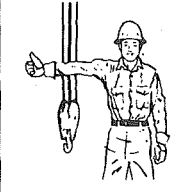
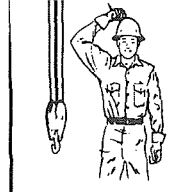
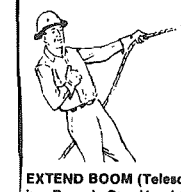
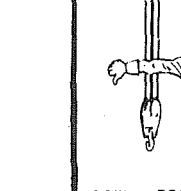
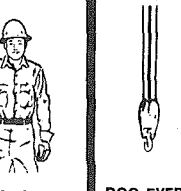
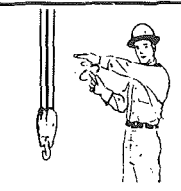
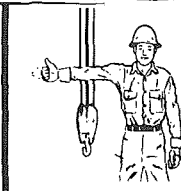
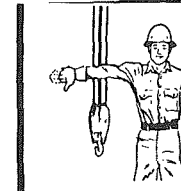
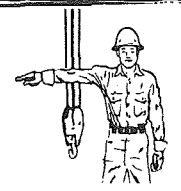
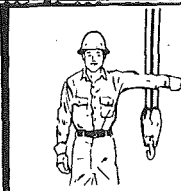
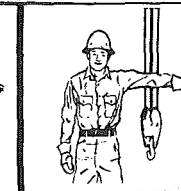
(3) The following hand signals shall be used for derricks and a copy shall be posted in the cab at the operator's station.

(4) The following hand signals shall be used for portal, tower, and pillar cranes and a copy shall be posted in the cab at the operator's station.

STANDARD HAND SIGNALS FOR CONTROLLING DERRICKS

		
HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.	LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.	DOG EVERYTHING. Clasp hands in front of body.
		
RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.	LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.	MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)
		
RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.	LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.	SWING. Arm extended, point with finger in direction of swing of boom.
		
STOP. Arm extended, palm down, hold position rigidly.	EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.	

STANDARD HAND SIGNALS FOR CONTROLLING PORTAL, TOWER AND PILLAR CRANES

		
HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.	LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.	USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand; then use regular signals.
		
RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.	USE MAIN HOIST. Tap fist on head; then use regular signals.	EXTEND BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.
		
LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.	DOG EVERYTHING. Clasp hands in front of body.	
		
MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)	RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.	LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.
		
SWING. Arm extended, point with finger in direction of swing of boom.	STOP. Arm extended, palm down, hold position rigidly.	EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-830, filed 8/27/81.]

WAC 296-78-835 Vehicles. (1) Vehicles.

(a) Scope. Vehicles shall include all mobile equipment normally used in sawmill, planing mill, storage, shipping, and yard operations, including log sorting yards.

(b) Lift trucks. Lift truck shall be designed, constructed, maintained and operated in accordance with the requirements of WAC 296-24-230 through 296-24-23035 of the general safety and health standards.

(c) Carriers. Drive chains on lumber carriers shall be adequately guarded to prevent contact at the pinch points.

(d)(i) Lumber carriers shall be so designed and constructed that the operator's field of vision shall not be unnecessarily restricted.

(ii) Carriers shall be provided with ladders or equivalent means of access to the operator's platform or cab.

(e) Lumber hauling trucks.

(i) On trucks where the normal operating position is ahead of the load in the direction of travel, the cab shall be protected by a barrier at least as high as the cab. The barrier shall be capable of stopping the weight of the load capacity of the vehicle if the vehicle were to be stopped suddenly while traveling at its normal operating speed. The barrier shall be constructed in such a manner that individual pieces of a normal load will not go through openings in the barrier.

(ii) Stakes, stake pockets, racks, tighteners, and binders shall provide a positive means to secure the load against any movement during transit.

(iii) Where rollers are used, at least two shall be equipped with locks which shall be locked when supporting loads during transit.

(2) Warning signals and spark arrestors. All vehicles shall be equipped with audible warning signals and where practicable shall have spark arrestors.

(3) Flywheels, gears, sprockets and chains and other exposed parts that constitute a hazard to workers shall be enclosed in standard guards.

(4) All vehicles operated after dark or in any area of reduced visibility shall be equipped with head lights and backup lights which adequately illuminate the direction of travel for the normal operating speed of the vehicle. The vehicle shall also be equipped with tail lights which are visible enough to give sufficient warning to surrounding traffic at the normal traffic operating speed.

(5) All vehicles operated in areas where overhead hazards exist shall be equipped with an overhead guard for the protection of the operator.

(6) Where vehicles are so constructed and operated that there is a possibility of the operator being injured by backing into objects, a platform guard shall be provided and so arranged as not to hinder the exit of the driver.

(7) Trucks, lift trucks and carriers shall not be operated at excessive rates of speed. When operating on tramways or docks more than six feet above the ground or lower level they shall be limited to a speed of not more than twelve miles per hour. When approaching blind corners they shall be limited to four miles per hour.

(8) Vehicles shall not be routed across principal thoroughfares while employees are going to or from work unless pedestrian lanes are provided.

(a) Railroad tracks and other hazardous crossings shall be plainly posted and traffic control devices (American National Standard D8.1 - 1967 for Railroad-Highway Grade Crossing Protection) should be utilized.

(b) Restricted overhead clearance. All areas of restricted side or overhead clearance shall be plainly marked.

(c) Pickup and unloading points. Pickup and unloading points and paths for lumber packages on conveyors and transfers and other areas where accurate spotting is required, shall be plainly marked and wheel stops provided where necessary.

(d) Aisles, passageways, and roadways. Aisles, passageways, and roadways shall be sufficiently wide to provide safe side clearance. One-way aisles may be used for two-way traffic if suitable turnouts are provided.

(9) Where an operator's vision is impaired by the vehicle or load it is carrying, he shall move only on signal from someone so stationed as to have a clear view in the direction the vehicle is to travel.

(10) Lift trucks shall be equipped, maintained and operated in compliance with the requirements of the general safety and health standard, WAC 296-24-230 through 296-24-23035.

(11) Load limits. No vehicle shall be operated with loads exceeding its safe load capacity.

(12) Vehicles with internal combustion engines shall not be operated in enclosed buildings or buildings with ceilings less than sixteen feet high unless the buildings have ventilation adequate to maintain air quality as required by the general occupational health standard, chapter 296-62 WAC.

(13) Vehicles shall not be refueled while motor is running. Smoking or open flames shall not be allowed in the refueling area.

(14) No employee other than trained operators or mechanics shall start the motor of, or operate any log or lumber handling vehicle.

(15) All vehicles shall be equipped with brakes capable of holding and controlling the vehicle and capacity load upon any grade or incline over which they may operate.

(16) Unloading equipment and facilities.

(a) Machines used for hoisting, unloading, or lowering logs shall be equipped with brakes capable of controlling or holding the maximum load in midair.

(b) The lifting cylinders of all hydraulically operated log handling machines, where the load is lifted by wire rope, shall be equipped with a positive device for preventing the uncontrolled lowering of the load or forks in case of a failure in the hydraulic system.

(c) A limit switch shall be installed on powered log handling machines to prevent the lift arms from traveling too far in the event the control switch is not released in time.

(d) When forklift-type machines are used to load trailers, a means of securing the loading attachment to the fork shall be installed and used.

(e) A-frames and similar log unloading devices shall have adequate height to provide safe clearance for swinging loads and to provide for adequate crotch lines and spreader bar devices.

(f) Log handling machines used to stack logs or lift loads above operator's head shall be equipped with overhead protection.

(g) Unloading devices shall be equipped with a horn or other plainly audible signaling device.

(h) Movement of unloading equipment shall be coordinated by audible or hand signals when operator's vision is impaired or operating in the vicinity of other employees.

Lift trucks regularly used for transporting peeler blocks or cores shall have tusks or a similar type hold down device to prevent the blocks or cores from rolling off the forks.

(17) Where spinners are used on steering wheels, they shall be of the automatic retracting type or shall be built into the wheel in such a manner as not to extend above the plane surface of the wheel. Vehicles equipped with positive anti-kickback steering are exempted from this requirement.

(18) Mechanical stackers and unstackers shall have all gears, sprockets and chains exposed to the contact of workers, fully enclosed by guards as required by WAC 296-78-710 of this chapter.

(19) Manually operated control switches shall be properly identified and so located as to be readily accessible to the operator. Main control switches shall be so designed that they can be locked in the open position.

(20) Employees shall not stand or walk under loads being lifted or moved. Means shall be provided to positively block the hoisting platform when employees must go beneath the stacker or unstacker hoist.

(21) No person shall ride any lift truck or lumber carrier unless a suitable seat is provided, except for training purposes.

(22) Unstacking machines shall be provided with a stopping device which shall at all times be accessible to at least one employee working on the machine.

(23) Floor of unstacker shall be kept free of broken stickers and other debris. A bin or frame shall be provided to allow for an orderly storage of stickers.

(24) Drags or other approved devices shall be provided to prevent lumber from running down on graders.

(25) Liquified petroleum gas storage and handling. Storage and handling of liquified petroleum gas shall be in accordance with the requirements of WAC 296-24-475 through 296-24-47517 of the general safety and health standards.

(26) Flammable liquids. Flammable liquids shall be stored and handled in accordance with WAC 296-24-330 through 296-24-33019 of the general safety and health standards.

(27) Guarding side openings. The hoistway side openings at the top level of the stacker and unstacker shall be protected by enclosures of standard railings.

(28) Guarding hoistway openings. When the hoist platform or top of the load is below the working platform, the hoistway openings shall be guarded.

(29) Guarding lower landing area. The lower landing area of stackers and unstackers shall be guarded by enclosures that prevent entrance to the area or pit below the hoist platform. Entrances should be protected by electrically interlocked gates which, when open, will disconnect the power and set the hoist brakes. When the interlock is not installed,

other positive means of protecting the entrance shall be provided.

(30) Lumber lifting devices. Lumber lifting devices on all stackers shall be designed and arranged so as to minimize the possibility of lumber falling from such devices.

(31) Inspection. At the start of each work shift, equipment operators shall inspect the equipment they will use for evidence of failure or incipient failure. Equipment found to have defects which might affect the operating safety shall not be used until the defects are corrected.

(32) Cleaning pits. Safe means of entrance and exit shall be provided to permit cleaning of pits.

(33) Preventing entry to hazardous area. Where the return of trucks from unstacker to stacker is by mechanical power or gravity, adequate signs, warning devices, or barriers shall be erected to prevent entry into the hazardous area.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-835, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-835, filed 8/27/81.]

WAC 296-78-840 Loading, piling, storage and conveying.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-840, filed 8/27/81.]

WAC 296-78-84001 Loading, piling, storage and conveying—General. (1) Units or loads of lumber built up for transportation by overhead cranes, lift trucks, auto trucks, or manually or mechanically operated transfers shall be provided with at least one set of stickers for each eighteen inches in height of unit or load. One set of stickers shall be not more than six inches from the top of units of lumber up to three inch dimension. Where dimension of material is greater than three inches, a set of stickers shall be placed under the top layer. Stickers shall extend the full width of the package, shall be uniformly spaced, and shall be aligned one above the other. Stickers may be lapped with a minimum overlapping of twelve inches. Stickers shall not protrude more than two inches beyond the sides of the package.

(2) Lumber loading. Loads shall be built and secured to insure stability in transit.

(3) Units or loads of lumber shall not be lifted or moved until all workers are in the clear.

(4) Gradient of roll sets or roll cases over which units of lumber are to be moved shall not exceed three percent. The movement of units shall be under control at all times.

(5) Stacking of lumber in yards, either by units or in block piles, shall be conducted in a safe and orderly manner.

(6) Foundations for piling lumber in yards shall be capable of supporting the maximum applied load without tipping or sagging.

(7) The height of stacked units in storage areas shall not exceed seven of the usual four foot units, subject to the following qualifications:

(a) Units of lumber shall not be stacked more than four high unless two or more stacks of units are tied together with ties.

(b) Long units of lumber shall not be stacked upon shorter packages except where a stable pile can be made with the use of package separators.

(c) In unit package piles, substantial polsters or unit separators shall be placed between each package directly over the stickers.

(8) Wooden horses used for loading preformed loads of lumber shall be of material not less than four by six inches in cross section net measure.

(9) Unstable piles. Piles of lumber which have become unstable shall be immediately made stable or removed.

(10) Lift boards or pallets shall be loaded in such a manner as to prevent material from spilling or the material shall be secured with a binder.

(11) Packing rooms shall be kept free of debris and chutes shall be equipped with a means of slowing down the materials.

(12) Sorting chains shall be provided with a stopping device which shall at all times be readily accessible to at least one employee working on the chain.

(13) The inside of the walkway of all green chains and sorting tables shall be provided with a standard toeboard.

(14) Rollers or other devices shall be provided for removing heavy dimension lumber from the cabin or table.

(15) Roll casings and transfer tables shall be cleaned regularly and shall be kept reasonably free from debris.

(16) In all permanent installations, green chains and sorting tables shall be roofed over to provide protection from inclement weather. Normal work stations shall be provided with a drained work surface which is evenly floored of non-slip material.

(17) Power driven rolls shall be operated in a manner to prevent end collisions.

(18) The space between live rolls shall be filled in on either side of crosswalks with material of structural strength to withstand the load imposed with a four to one safety factor.

(19) The driving mechanism of live rolls shall be guarded wherever exposed to contact.

(20) Live rolls shall be replaced when their surface develops a break or hole.

(21) Guarding. Spiked live rolls shall be guarded.

(22) Ramps or skidways used to transfer lumber or materials from one level to another shall be provided with all safeguards necessary for the protection of workers.

(23) Landings on a lower level where lumber or timbers are discharged over ramps or skidways shall be provided with a solid bumper not less than six inches in height at the outer edge. Such landing shall be maintained in good repair at all times.

(24) Ramps or skidways shall be so arranged that the person putting lumber down shall have a clear view of the lower landing. Lumber or timbers shall not be put down until all workers are in the clear.

(25)(a) The under face of all ramp or skidway landings shall be fenced off or other positive means provided to prevent persons from walking out under dropping timber.

(b) Return strands of sorting table ramp chains shall be supported by troughs of sufficient strength to support the weight of a broken chain.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-84001, filed 8/27/81.]

WAC 296-78-84003 Conveyors. (1) Construction, operation, and maintenance of conveyors shall be in accordance with American National Standard B20.1 - 1957, Safety Code for Conveyors, Cableways and related equipment.

(2) Conveyor troughs in which the working strands of a conveyor operate shall be of ample dimension and strength to carry a broken chain and shall afford effective protection to all employees.

(3) When the return strand of a conveyor operates within seven feet of the floor there shall be a trough provided of sufficient strength to carry the weight resulting from a broken chain.

(4) When the return strands of a conveyor pass over passageways or work areas such guards shall be placed under them as will effectively protect workers.

(5) When the working strand of a conveyor crosses within three feet of the floor level in passageways, the trough in which it works shall be bridged the full width of the passageway.

(6) Where conveyor, idler pulleys or other equipment is located over or dangerously near burning refuse, any worker going to such location shall use a safety line which shall be securely fastened to his body and tended by a helper.

(7) Conveyors shall be provided with an emergency panic-type stopping device which can be reached by a person in a sitting position on the conveyor. Such device shall be located near the material entrance to each barker, chipper, hog, saw, or similar type of equipment except where the conveyor leading into such equipment is under constant control of an operator who has full view of the material entrance and is located or restrained where he/she cannot possibly fall onto the conveyor. The device shall stop the conveyor a sufficient distance away from the hazard to prevent injury or further injury by the hazard.

(8) Screw or auger type conveyor troughs and boxes shall be equipped with covers. If it is not practical to cover the troughs or boxes, other equivalent type guards shall be provided.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-84003, filed 8/27/81.]

WAC 296-78-84005 Dry kilns. (1) Transfer, kiln and dolly tracks shall be properly maintained at all times and shall have a grade of not more than one and one-fourth percent. Bumpers or stops shall be installed at the ends of all tracks capable of stopping a normal load for which the track is installed. A means shall be provided for chocking or blocking cars.

(2) Doors.

(a) Main kiln doors. Main kiln doors shall be provided with a method of holding them open while kiln is being loaded.

(b) Counterweights on vertical lift doors shall be boxed or otherwise guarded.

(c) Means shall be provided to firmly secure main doors, when they are disengaged from carriers and hangers, to prevent toppling.

(3) Kilns whose operation requires inside inspection shall be maintained with not less than eighteen inches clearance between loaded cars and the walls of the kiln. The requirements for personal protective equipment specified in chapter 296-24 WAC, Part A-2, general safety and health standards, and chapter 296-62 WAC, Part E, general occupational health standards, shall be complied with.

(4) Kiln loads shall be equipped or arranged for easy attachment and detachment of transfer cables. Means for stopping kiln cars shall be available at all times.

(5) Cars shall not be moved until tracks are clear and workers are out of the bight of transfer lines.

(6) When kiln or dolly loads of lumber are permitted to coast through or adjacent to any work area, audible warning shall be given.

(7) Stickers shall not be allowed to protrude more than two inches from the sides of kiln stacks.

(8) Yards and storage areas shall be kept reasonably free of debris and unnecessary obstruction. Warning signs shall be conspicuously posted wherever there is danger from moving vehicles or equipment.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-84005, filed 8/20/96, effective 10/15/96; 94-20-057 (Order 94-16), § 296-78-84005, filed 9/30/94, effective 11/20/94. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-84005, filed 8/27/81.]

WAC 296-78-84007 Chippers and hogs. (1) Chippers. The feed system to the chipper shall be arranged so the operator does not stand in direct line with the chipper spout (hopper). The chipper spout shall be enclosed to a height or distance of not less than forty inches from the floor or the operator's station. A safety belt and lifeline shall be worn by workers when working at or near the spout unless the spout is guarded. The lifeline shall be short enough to prevent workers from falling into the chipper.

(2) Hog mills shall be provided with feed chutes so designed and arranged that from no position on the rim of the chute shall the distance to the knives or feed roll be less than forty inches. Baffles shall be provided which shall effectively prevent material from being thrown from the mill.

(3) Employees feeding hog mills shall be provided with safety belts and lines, which they shall be required to use at all times, unless otherwise protected from any possibility of falling into the mill.

[Statutory Authority: Chapter 49.17 RCW. 96-17-056, § 296-78-84007, filed 8/20/96, effective 10/15/96. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-84007, filed 8/27/81.]

WAC 296-78-84009 Bins and bunkers. (1) Bins, bunkers, hoppers, and fuel houses. Guarding. Open bins, bunkers, and hoppers whose upper edges extend less than three feet above working level shall be equipped with standard handrails and toeboards, or have their tops covered by a substantial grill or grating with openings small enough to prevent a person from falling through.

(2) Fuel hoppers shall be provided with doors that may be remotely operated.

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(3) Fuel hoppers shall be provided with platforms with standard railings and adequately lighted for the protection of workers taking out fuel.

(4)(a) Fuel bins shall be provided with an approved railed platform or walkway near the top or other approved means, for the use of employees engaged in dislodging congested fuel. No employee shall enter any fuel bin except where adequately safeguarded.

(b) Recognizing however, the varying designs of fuel storage vaults and the type of fuel handled and certain peculiar local conditions, the adequacy of safety devices shall be determined by a duly authorized representative of the department of labor and industries, division of industrial safety and health.

(c) During operations when the flow of normal fuel is interrupted but dust from operating sanders is received in the bin, workers shall not enter the fuel bin until the flow of sander dust has been discontinued and the dust has settled.

(d) Use of wheeled equipment to load bins. Where automotive or other wheeled equipment is used to move materials into bins, bunkers, and hoppers, adequate guard rails shall be installed along each side of the runway, and a substantial bumper stop provided when necessary.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-84009, filed 8/27/81.]

WAC 296-78-84011 Burners. (1) Burners and smoke stacks other than the self-supporting type shall be adequately guyed. Buckle guys shall be installed if burner or stack is more than fifty feet in height.

(2) Runway. The conveyor runway to the burner shall be equipped with a standard handrail. If the runway crosses a roadway or thoroughfare, standard toeboards shall be provided in addition.

[Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-18-029 (Order 81-21), § 296-78-84011, filed 8/27/81.]

Chapter 296-79 WAC

SAFETY STANDARDS FOR PULP, PAPER, AND PAPERBOARD MILLS AND CONVERTERS

WAC

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DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER

296-79-060	Protection from radiation. [Order 74-24, § 296-79-060, filed 5/6/74; Order 70-6, § 296-79-060, filed 7/10/70, effective 8/10/70.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-255	Safety procedure for handling liquid sulfur. [Order 74-24, § 296-79-255, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-27001	Barkers, chippers, and hog feed devices. [Order 74-24, § 296-79-27001, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-29019	Guarding hand knives and sharpening steels. [Order 74-24, § 296-79-29019, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-29025	Repairing shredders. [Order 74-24, § 296-79-29025, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-31005	Adhesive system. [Order 74-24, § 296-79-31005, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-31007	Printing and cutting. [Order 74-24, § 296-79-31007, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-31011	Power lifts on gluers, tapers and stitchers. [Order 74-24, § 296-79-31011, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.
296-79-31013	Strapping-banding operations. [Order 74-24, § 296-79-31013, filed 5/6/74.] Repealed by 99-16-083, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050.

WAC 296-79-010 Scope and application. (1) This chapter applies to establishments, firms, persons and corporations that manufacture, process, store, finish, or convert pulp, paper or paperboard and includes all buildings, machinery, and equipment.

(2) This chapter shall augment the Washington state general safety and health standards (chapter 296-24 WAC) and general occupational health standards (chapter 296-62 WAC). In the event of any conflict between any portion of this chapter and any portion of any of the general application standards, the provisions of this chapter 296-79 WAC, shall prevail.

(3) The rules contained in this chapter are minimum requirements and the use of additional guards, or other means, methods or procedures may be needed to make the work or place of work safe.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-010, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-010, filed 5/6/74; Order 70-6, § 296-79-010, filed 7/10/70, effective 8/10/70.]

WAC 296-79-011 Definitions. "Authorized" - One who is qualified by reason of training and to whom the responsibility to perform a specific assignment has been given by the employer.

"Guarded" - The means to remove the likelihood of approach or contact by persons or objects to a point of danger.

"Knowledgeable" - The demonstrated ability to communicate the safe work practices required to perform a job or task correctly.

"Qualified" - One who is familiar with the construction and operation of the equipment and the duties of the position they may be filling. This includes being aware of the hazards of the job and the means and procedures necessary to eliminate or control those hazards.

"Training" - The procedure that must establish and document the employee's competency in the work practices that they are required to perform.

"Shall" or "must" as used in this standard mean the requirement is compulsory.

"May" or "should" as used in this standard identify recommendations or suggestions only.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-011, filed 8/3/99, effective 11/3/99.]

WAC 296-79-020 General requirements. (1) House-keeping.

(a) Floors must be kept reasonably clear of spilled or leaking oil, grease, water, broke, etc., that may cause slipping, tripping or falling. Nonskid type surfacing must be installed in vehicular or pedestrian traffic areas where slipping hazards otherwise would exist.

In areas where it is not possible to keep the floor free of materials which cause a slipping hazard, mats, cleats, or other suitable materials which will effectively minimize or eliminate the hazard must be installed.

(b) Hoses, cords, slings or similar items or equipment must be stored in such a manner that they will not create a hazard.

(2) Storage and transportation of materials. Materials, objects or equipment must be stored or transported by methods which will prevent them from falling, tipping or rolling.

(3) Warning of open manholes or excavations. Open manholes or excavations must be:

- Roped off, barricaded, or adequately safeguarded when located in or adjacent to walkways, aiseways, or roadways.
- Provided with warning lights or lanterns during periods of darkness or reduced visibility.

(4) Training. Employees must receive proper instruction and be familiar with safe operating procedures:

(a) Before they supervise the operation, or make adjustments to any machine or equipment.

(b) To be able to cope with emergencies arising from breaks, ruptures, or spills which would create a hazardous condition.

(c) For lifting and moving objects. Mechanical devices should be used or employees should ask for assistance in lifting or moving heavy objects.

(d) On prompt reporting of any faulty equipment or hazardous condition to the person in charge.

(5) Working alone. When an employee is assigned to work alone in a remote or isolated area, procedures must be developed to ensure:

- That the employee reports by use of radio or telephone to someone periodically; or
- At reasonable intervals a designated person must check on the employee; and
- All persons involved in working alone are advised of the procedures to be followed.

(6) Exits from hazardous areas. Where physically and reasonably possible, there must be at least two unobstructed exits from any hazardous area. Such exits should be on opposite walls.

(7) Safe work area. Sufficient clearance must be maintained between machines to allow employees a safe work area.

(8) Protection from overhead hazard. Warning signs/devices must be:

- Placed in conspicuous locations below areas where overhead work is being done and
- Removed promptly when work is completed and the overhead hazard no longer exists.

(9) Welding areas protected.

(a) Areas in which welding is being done must be screened or barricaded to protect persons from flash burns, when practical.

(b) If the welding process cannot be isolated, all persons who may be exposed to the hazard of arc flash must be properly protected.

(10) Testing safety devices. Brakes, back stops, anti-run-away devices, overload releases, emergency stops, and other safety devices must be inspected and tested frequently to ensure that all are operative and maintained in good repair.

(11) Starting and stopping devices.

• Electrically or manually operated power starting or stopping devices must be provided within easy reach of the operator from the normal operating position.

• If necessary for safety of the operation, the machine must be so equipped that retarding or braking action can be

applied at the time of or after the source of power is deactivated.

(12) Interlocks:

Interlocks that affect the safety of employees must not be bypassed except where the employer demonstrates that alternate procedures or devices provide a level of safety for employees equivalent to that provided by the safety interlock. Interlocks are considered to be bypassed anytime the designed control strategy is bypassed by means including, but not limited to, a temporary wiring change, physical interference or a temporary software change of "force."

Prior to bypassing a safety interlock the employer must:

• Develop a written procedure detailing how the bypass will be accomplished and the alternate means of protecting employees.

• Inform affected employees of all pertinent information including at a minimum the reason for the change, the date of the change, who is responsible for the change, and approximately how long the change will be in effect.

• Post appropriate warning of the change on the equipment or area.

(13) Designing control systems. Employers must ensure that all control systems are designed to:

• Ensure that the system does not create an unsafe state that endangers personnel.

• Ensure that when control systems fail, the equipment being controlled fails to a safe state.

• Have an independent method to safely stop the process or equipment, such as a hardwired emergency stop button or other controls that deenergize the system, or independent methods to force the system to a safe state.

(14) Compressed air.

(a) Compressed air must not be used for cleaning clothing that is being worn, or if it will endanger persons in the area.

(b) Sections of high pressure air hoses must be properly coupled and have safety chains or equivalent safety device attached between the sections (30 psi or more is high pressure air).

(15) Punch bars. Open pipes must not be used as punch bars if the use would create a hazard.

(16) Saw table limit stop or extension. Employees must be protected from contact with the front edge of a circular saw by:

• A limit stop which will prevent the forward swing of the cutting edge from extending beyond the edge of the table or

• Installation of a table extension.

(17) Powder-actuated tools.

• Powder-actuated tool design, construction, operation and use shall comply with all requirements specified in "safety requirements for powder actuated fastening systems," (see chapter 296-24 WAC, Part H-1).

• A careful check must be made to ensure that no cartridges or charges are left where they could enter equipment or be accidentally discharged in any area where they could create a fire or explosion hazard.

(18) Ladders required on waterfront docks. Employers must ensure that either permanent ladders or portable ladders:

- Are readily available for emergency use on all water-front docks.
- Extend from the face of the dock to the water line at its lowest elevation.
- Are installed at intervals not to exceed 400 feet.
- Are noticeable by painting the dock area immediately adjacent to the ladder with a bright color which contrasts with the surrounding area.
- Have been secured with a suitable method.

Note: When working on or around water also see chapter 296-24 WAC, Part A-2.

(19) Prevent overhang while removing materials. Extreme care must be taken to prevent material from creating an overhang while removing the materials from piles or bins.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-020, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.040 and 49.17.050. 82-13-045 (Order 82-22), § 296-79-020, filed 6/11/82; Order 77-12, § 296-79-020, filed 7/11/77; Order 74-24, § 296-79-020, filed 5/6/74; Order 70-6, § 296-79-020, filed 7/10/70, effective 8/10/70.]

WAC 296-79-030 Guards and guarding. For additional guarding requirements see chapter 296-24 WAC, Part C.

(1) Safeguarding specific areas, machines or conditions. Certain equipment, tools, machines, and areas present definite hazards and must be safeguarded by compliance with the following requirements:

(a) Broke shredders. Cutting heads must be completely enclosed except for opening at feed side sufficient only to permit entry of stock. The enclosure must be:

- Bolted or locked in place, and
- Of solid material or with mesh or other openings not exceeding 1/2 inch.

(b) Stitching or sewing machine. Carton or bag stitching machines must be properly safeguarded to prevent persons from coming in contact with the stitching head and other pinch or nip points.

(c) Beaters and pulpers.

(i) A guardrail of standard height must be installed when the top edge of vessels or tubs is less than standard height guardrails above the floor or operator's platform. If necessary for the protection of the person feeding equipment, an intermediate guardrail or other suitable protection shall be installed.

(ii) Beater rolls must be provided with covers.

(d) First dryer. A permanent guard or apron guard, or both, must be installed to protect workers from any exposed ingoing nip of the first dryer drum in each section if the area is accessible to workers while the dryer is in operation.

(e) Floor and drain openings. Floor and drain openings in walkways and general work areas must be covered with material or gratings with openings no larger than 2" in the narrow dimension.

(f) Mechanical devices to dump chip cars, trucks or trailers.

- When using mechanical equipment to elevate the front end of the chip containers for dumping into a hopper, the shear area between the floor and the elevated section must be safeguarded.

- The pit area must be adequately safeguarded or barricaded.

- Safeguards must be installed around the exposed sides of a chip hopper.

(2) Replacing guards. All permanent guards must be replaced or adequate temporary safeguards provided before a machine is put into operation.

(3) Protection from moving materials. When material, such as chunks, slivers, cants, or logs, could be thrown or flipped by a saw, barker, or other machines, adequate barricades, screens, netting, or other safeguards must be provided and maintained.

(4) Protection for areas where guards are impractical. When normal guarding is impractical:

- The hazard must be reduced to a minimum by use of safety chains, lifelines, signs or other reasonable means, and
- Areas which present a hazard which cannot be reasonably safeguarded must be identified by use of paint or other materials.

(5) Knives and scissors.

(a) Knives used for chip or hog fuel machines, or guillotine cutters, must be secured in properly constructed containers during transportation.

(b) Workers must be furnished properly designed and constructed sheaths for safely carrying knives and scissors used for cutting or trimming pulp and paper.

(c) Tables where paper is being cut must be equipped with sheaths or shelves for safe storage of knives and scissors.

(d) Sharp edged slitter knives subject to accidental contact must be effectively guarded. Carriers must be provided and used when transporting or carrying sharp edged slitter knives.

(e) Hand knives and sharpening steels used in paper preparation, must be provided with guards at the junction of the handle and the blade. Utility knives with blade exposure two and one-half inches or less are exempted from this requirement.

(6) Safeguard for foot operated treadle switch used to activate power driven equipment. Foot operated treadle switches used for activation of power driven equipment must be protected by a stirrup type guard or equivalent protection must be provided to prevent accidental activation.

(7) Automatic pressure actuated stopping devices. Hand fed machines and other moving equipment which create shear or pinch points which cannot be reasonably guarded may be safeguarded by the installation of pressure activated bars or sensing devices which, when contacted, will automatically stop the machine or equipment.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-030, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-030, filed 5/6/74; Order 70-6, § 296-79-030, filed 7/10/70, effective 8/10/70.]

WAC 296-79-040 Fire protection, ignition sources and means of egress. For fire protection, ignition source, and means of egress requirements see chapter 296-24 WAC, Part G-1, G-2 and G-3.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-040, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-

040, filed 5/6/74; Order 70-6, § 296-79-040, filed 7/10/70, effective 8/10/70.]

WAC 296-79-050 Personal protection clothing and equipment. See chapter 296-24 WAC, Part A-2, for additional personal protective equipment requirements.

(1) Rings or other jewelry that could create a hazard should not be worn by employees while in the performance of their work.

(2) Protective footwear.

• Employees who work in areas where there is a possibility of foot injury due to falling or rolling objects must wear safety type footwear.

• Employers will supply shoe guards and toe protectors.

• Employers must also make safety shoes available for purchase by employees at not more than actual cost to the employer.

(3) Calks or other suitable footwear that will afford reasonable protection from slipping must be:

• Worn while working on logs.

• Made available at not more than actual cost to the employer.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-050, filed 8/3/99, effective 11/3/99. Statutory Authority: Chapter 49.17 RCW. 94-20-057 (Order 94-16), § 296-79-050, filed 9/30/94, effective 11/20/94; 89-11-035 (Order 89-03), § 296-79-050, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. 83-24-013 (Order 83-34), § 296-79-050, filed 11/30/83; 82-13-045 (Order 82-22), § 296-79-050, filed 6/11/82; Order 74-24, § 296-79-050, filed 5/6/74; Order 70-6, § 296-79-050, filed 7/10/70, effective 8/10/70.]

WAC 296-79-070 Illumination. (1) Illumination required. Lighting that is adequately adjusted to provide a margin of safety for all work tasks must be provided and maintained.

(a) The minimum level of task lighting for all indoor activities must be an average of ten-foot candles measured thirty inches above the floor or at the task.

(b) The minimum level of task lighting for all outdoor activities must be an average of five-foot candles measured thirty inches above the working surface or at the task.

(2) If general lighting is not provided throughout the work area, the employer must provide illumination which is adequately adjusted to provide visibility of nearby objects that might be potential hazards or to see to operate emergency control or other equipment. The minimum level of nontask lighting for all indoor and outdoor activities must be an average of three-foot candles measured thirty inches above the floor or working surface.

Note: This section establishes minimal levels of illumination for safety purposes only. Guidelines pertaining to optimal levels of lighting and illumination may be found in practice for Industrial Lighting, ANSI/IES RP7-1979. The minimum levels specified in subsections (1) and (2) of this section represent averages with the lowest level in an area to be no less than fifty percent of the indicated value.

(3) Emergency or secondary lighting system required.

(a) There must be an emergency or secondary lighting system that can be actuated immediately upon failure of the normal power supply system. The emergency or secondary lighting system must provide illumination in the following areas:

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• Wherever it is necessary for workers to remain at their machine or station to shut down equipment in case of power failure.

• At stairways and passageways or aiseways used by workers as an emergency exit in case of power failure.

(b) Emergency lighting facilities must be checked at least every 30 days for mechanical defects. Defective equipment must be given priority for repair schedule.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-070, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-070, filed 5/6/74; Order 70-6, § 296-79-070, filed 7/10/70, effective 8/10/70.]

WAC 296-79-080 Elevators, manlifts and other lifting devices. (1) All elevators, manlifts or other lifting devices must be installed and maintained in conformity with the requirements specified in the Washington state elevator laws and regulations adopted by the elevator section of the department of labor and industries.

(2) Inspection of elevators, etc., for acid towers.

(a) Outside elevators must be inspected daily during winter months when ice materially affects safety.

(b) Elevators, runways, stairs, etc., for acid towers must be inspected monthly for defects that may occur because of exposure to acid or corrosive gases.

(3) Respirators on elevators. Elevators located in areas where exposure to potentially harmful concentrations of toxic substances may occur must be equipped with an adequate supply of respirators to protect the maximum number of passengers.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-080, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-080, filed 5/6/74; Order 70-6, § 296-79-080, filed 7/10/70, effective 8/10/70.]

WAC 296-79-090 Electrical equipment and distribution. All electrical installations and electrical utilization equipment must comply with chapter 296-24 WAC, Part L.

(1) Operator controlled devices. Push buttons, selector switches, remote control switches, automatic circuit activating devices, and other control circuit type devices must be marked to indicate their function and the equipment they control.

(2) Posting equipment automatically activated or remotely controlled. If it will create a hazard to personnel, equipment which is automatically activated or remotely controlled must be posted, warning persons that machine may start automatically.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-090, filed 8/3/99, effective 11/3/99. Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-79-090, filed 11/22/91, effective 12/24/91; Order 74-24, § 296-79-090, filed 5/6/74; Order 70-6, § 296-79-090, filed 7/10/70, effective 8/10/70.]

WAC 296-79-100 Floors, platforms, stairways, ladders, loading docks. See chapter 296-24 WAC, Part J.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-100, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-100, filed 5/6/74; Order 70-6, § 296-79-100, filed 7/10/70, effective 8/10/70.]

WAC 296-79-110 Elevated runways and ramps used by vehicles. (1) Runways and ramps must:

(a) Be cleated, grooved, rough surfaced, or covered with a material that will minimize the danger of skidding.

(b) Not have a maximum incline exceeding 20° from horizontal if used for wheeled equipment.

(2) Guarding exposed sides.

• Elevated ramps or runways used for the travel of wheeled equipment must have exposed sides guarded with a substantial bull rail or shear rail of sufficient height to prevent wheeled equipment from going over the rail.

• If elevated ramps or runways are used by pedestrians, standard guardrails must be installed on runways wherever the height exceeds 4 feet above the adjacent area except where used for loading or unloading purposes.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-110, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-110, filed 5/6/74; Order 70-6, § 296-79-110, filed 7/10/70, effective 8/10/70.]

WAC 296-79-120 Scaffolds, construction, use and maintenance. See General safety and health standards, chapter 296-24 WAC, Part J-1 or Safety standards for construction work, chapter 296-155 WAC, Part J-1.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-120, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-120, filed 5/6/74; Order 70-6, § 296-79-120, filed 7/10/70, effective 8/10/70.]

WAC 296-79-130 Crossovers, aisles, passages. See chapter 296-24 WAC, Part D, for additional requirements for aisles and passages.

(1) Clearances to be marked. Low clearance areas under conveyors which could present a hazard to mobile equipment operations must be identified by a suitable means, such as signs, contrasting colors, or tell-tales.

(2) Crossovers over obstructions in passageways. Cross-overs must be provided where employees are required to cross over transmission drive lines or other permanent obstructions in passageways or walkways.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-130, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-130, filed 5/6/74; Order 70-6, § 296-79-130, filed 7/10/70, effective 8/10/70.]

WAC 296-79-140 Installation, inspection, and maintenance of pipes, piping systems, and hoses. (1) Definitions applicable to this section.

"Hazardous material system" - any system within the following classifications:

• Flammable or explosive - any system containing materials which are hazardous because they are easily ignited and create a fire or explosion hazard, defined by NFPA as Class I liquids;

• Chemically active or toxic - any system containing material which offers corrosion or toxic hazard in itself or can be productive of harmful gases upon release, defined by NFPA 704M as Class 3 and 4 materials;

• Thermally hazardous - any system above 130°F which exposes persons to potential thermal burns;

[Title 296 WAC—p. 1948]

• Pressurized - any gaseous system above 200 psig or liquid system above 500 psig.

"Piping system" - any fixed piping, either rigid pipe or flexible hose, including all fittings and valves, in either permanent or temporary application.

(2) Design and installation. All new piping systems intended to be used in hazardous material service must be designed and installed in accordance with applicable provisions of the ASME Code for Pressure Piping or in accordance with applicable provisions of ANSI B31.1-1995 through B31.8-1995.

(3) Inspection and maintenance.

(a) The employer must develop a formal program of installation inspections and maintenance for all hazardous material piping systems. The program must be:

• Based on sound maintenance engineering principle, and

• Demonstrate due consideration for the manufacturing specifications of the pipe, hose, valves and fittings, the ambient environment of the installation and the corrosive or abrasive effect of the material handled within the system.

(b) Type and frequency of tests and/or inspections and selection of inspection sites must be adequate to give indications that minimum safe design operating tolerances are maintained. The tests may include visual or nondestructive methods.

(4) Inspection records.

(a) Results of inspections and/or tests must be maintained as a record for each system. Portions of systems that are buried or enclosed in permanent structures in such a manner as to prevent exposure to employees even in the event of a failure, may be exempted from the inspection requirements only.

• Past records may be discarded provided the current inspection report and the immediately preceding two reports are maintained.

• When a system is replaced, a new record must be established and all past records may be discarded.

(b) Upon request the records for each system must be made available for review by the department of labor and industries.

(5) Systems or sections of systems found to be below the minimum design criteria requirements for the current service must be repaired or replaced with component parts and methods which equal the requirements for new installations.

(6) Identification of piping systems.

(a) Pipes containing hazardous materials must be identified. It is recommended that USAS A13.1 "Scheme for Identification of Piping Systems" be followed.

Positive identification of a piping system content:

• Must have a lettered legend giving the name of the content in full or abbreviated form, or a commonly used identification system.

• Must be made and maintained at suitable intervals and at valves, fittings, and on both sides of walls or floors as needed.

• May have arrows to indicate the direction of flow.

• May provide necessary supplementary information such as hazard of use. This may be done by additional legend

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or by color applied to the entire piping system or as colored bands. Legends may be placed on colored bands.

Examples of legend which may give both positive identification and supplementary information regarding hazards or use are:

Ammonia	Hazardous liquid or gas
Chlorine	Hazardous liquid or gas
Chlorine dioxide	Hazardous liquid or gas
Sulphur dioxide	Hazardous gas
Liquid caustic	Hazardous liquid
Liquid sulphur	Hazardous liquid
Sulphuric acid	Hazardous liquid
Sodium chlorate	When dry, danger of fire or explosion

Note: Manual L-1, published by Chemical Manufacturers Association, Inc., is a valuable guide in respect to supplementary legend.

• When color, applied to the entire piping system or as colored bands, is used to give supplementary information it should conform to the following:

CLASSIFICATION	PREDOMINANT COLOR
F—Fire-protection equipment	Red
D—Dangerous materials	Yellow (or orange)
S—Safe materials	Green (or the achromatic colors, white, black, gray or aluminum)

and, when required,

P—Protective materials	Bright blue
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(b) When legend systems are used, legend boards showing the color and identification scheme in use must be prominently displayed at each plant. They must be located so that employees who may be exposed to hazardous material piping systems will have a frequent reminder of the identification program.

(c) All employees who work in the area of hazardous material piping systems must be given training in the color and identification scheme in use.

(7) Steam hoses. Steam hoses must be specifically designed to safely carry steam at any pressures to which they may be subjected.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-16-083, § 296-79-140, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-79-140, filed 6/17/81. Statutory Authority: RCW 49.17.040, 49.17.240, and chapters 43.22 and 42.30 RCW. 81-03-007 (Order 80-31), § 296-79-140, filed 1/8/81; Order 74-24, § 296-79-140, filed 5/6/74; Order 70-6, § 296-79-140, filed 7/10/70, effective 8/10/70.]

WAC 296-79-150 Powered industrial trucks and other equipment. Additional requirements on mobile equipment and lift trucks are in chapter 296-24 WAC, Part D.

(1) The operator of a power-driven vehicle must test the brakes, steering gear, lights, horns, warning devices, clutches, etc., before operating vehicle.

(2) Control levers of lift trucks, front end loaders, or similar types of equipment must not be operated except when the operator is in the proper operating position.

(3) No person may be permitted to ride on a powered hand truck unless it is so designed by the manufacturer. A limit switch must be on the operating handle—30 degrees each way from a 45-degree angle up and down.

(4) Employees must not work below the raised bed of a dump truck, raised buckets of front end loaders, raised blades of tractors or in similar positions without blocking the equipment in a manner that will prevent it from falling.

(5) Reporting suspected defects. If, in the opinion of the operator, a power-driven vehicle is unsafe, the operator must report the suspected defect immediately to the person in charge. Any defect that would make the vehicle unsafe to operate under existing conditions will be cause to take the vehicle out of service and it must not be put back into use until it has been made safe.

(6) Vehicle operators must have a reasonably unobstructed view of the direction of travel, or, where this is not possible, the operator must be directed by a person or by a safe guidance means or device. Where practical, mirrors must be installed at blind corners or intersections that will allow operators to observe oncoming traffic.

(7) Vehicles in congested areas must operate with a warning light.

(8) Passengers must not be permitted to ride with legs or arms extending outside any vehicle nor must they be permitted to ride unless a passenger seat or other protective device is provided.

(9) Guard on operator's platform. Every power truck operated from an end platform or standing position must be:

• Equipped with a platform extending beyond the operator's position, and

• Strong enough to withstand a compression load equal to the weight of the loaded vehicle applied along the longitudinal axis of the truck with the outermost projection of the platform against the flat vertical surface.

(10) Cleaning vehicles. All vehicles must be kept free of excessive accumulations of dust and grease that may present a hazard.

(11) Vehicles must be controlled manually while being pushed or towed except when a tow bar is used. Pushing of vehicles or railroad cars with the forks or clamps of a lift truck is prohibited.

(12) Aisles or passageways should be at least three feet wider than the widest vehicle or load traveling the aisle or passageway. When this clearance cannot be maintained, adequate precautions must be taken.

(13) The forks, clamps, or attachments of lift trucks must be kept as low as possible while the vehicle is moving.

(14) The hoisting of personnel by lift trucks must meet the requirements in WAC 296-24-230.

(15) Exhaust systems on lift trucks and jitneys shall be constructed to discharge either within 20 inches from the floor or 84 inches or more above the floor.

(16) Mobile equipment with an enclosed cab must be provided with an escape hatch or other method of exit in case the regular exit cannot be used.

(17) Suitable methods must be used or devices installed which will prevent the trailer from tipping while being loaded or unloaded.

(18) Whenever vehicles using LP gas as a fuel are parked overnight or stored for extended periods of time indoors, with the fuel container in place, the service valve of the fuel container must be closed.

(19) The use of spinners on steering wheels must be prohibited unless an anti-kick device is installed or the equipment has a hydraulic steering system.

(20) Rolls transported with a grab or clamp attachment must be carried with the core in a vertical position.

(21) When traveling empty with a grab or clamp attachment, the jaws or blades of those attachments must remain within the running lines of the lift truck.

(22) When transporting two or more rolls with a roll grab attachment, the bottom roll will have at least sixty percent of the grab attachment on it.

(23) When transporting two or more rolls or bales with a grab or clamp attachment, there must be no rolls or bales unsecured if there is risk of part or all of the load shifting or falling.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-150, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-150, filed 5/6/74; Order 70-6, § 296-79-150, filed 7/10/70, effective 8/10/70.]

WAC 296-79-160 Requirements for cranes and hoists—See general safety and health standards (chapter 296-24 WAC, Part D). Grounding - Where conditions such as corrosive atmospheres, dirt, paint, rust, or other insulating materials prevent reliable metal-to-metal contact for grounding (bridge, wheel and its respective tracks), a separate ground conductor must be provided.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-160, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-160, filed 5/6/74; Order 70-6, § 296-79-160, filed 7/10/70, effective 8/10/70.]

WAC 296-79-170 Requirements for crawler and truck cranes. (1) Boom length indicated. The length must be plainly marked on each boom section of a mobile crane having a sectioned boom.

(2) Radius or boom angle indicator. A radius or boom angle indicator must be installed where it is readily visible to the operator's normal operating position on all cranes having a movable working boom.

(3) Safety device for light fixtures. Any light fixtures attached to crane boom or machinery house must have a safety strap or other device attached which will prevent the fixture from falling.

(4) Boom stops. Boom stops must be:

- Installed to govern the upward travel of the boom to a safe limit.
- Of adequate strength to prevent the boom from traveling past the vertical position.

(5) Controls marked. Crane operating controls must be marked or an explanation of the controls' functions must be posted in full view of the operator.

(6) Locking hydraulic outriggers. Hydraulic outriggers must be:

- Equipped with a pilot operated check valve or

- Installed with a mechanical lock which will prevent outriggers from retracting in case of failure of the hydraulic system.

(7) Top of boom painted. The top six feet of the boom or jib must be painted bright yellow or other bright contrasting color if the boom is yellow.

(8) Warning devices. All cranes must be equipped with a suitable warning device such as a horn or whistle.

(9) Hook safety device. All hooks must be equipped with a safety device or other effective means must be used to prevent accidental unhooking of the load.

(10) Counterweight limited. The amount of crane counterweight must not exceed the maximum amount specified by the crane manufacturer.

(11) Use proper size wire rope for sheaves. The size and diameter of sheaves and wire rope must be compatible and follow the recommendations by the manufacturer, published by the Wire Rope Institute or other acceptable engineering practices.

(12) Loading or unloading gear. Unloading gear such as grapples, tongs, and buckets, must not be left suspended when not in use or whenever the machine is unattended.

(13) No one under load. Personnel must not position themselves under crane loads and such loads must not be carried over workers.

(14) Operating clearance from stationary objects. Where the area is accessible to workers:

- A distance of 30 inches must be maintained between the outermost part of a revolving crane and any stationary object within the swing radius of the crane or

- The hazardous area must be temporarily guarded or barricaded.

(15) See WAC 296-24-960 when working around energized lines.

(16) Operators must avoid contacting overhead obstructions which may damage the boom or adversely affect stability. In instances where the operator may have difficulty in observing clearances, a signal person must be stationed where they can observe clearances and signal the operator.

(17) Safe travel across thoroughfares or railroad tracks.

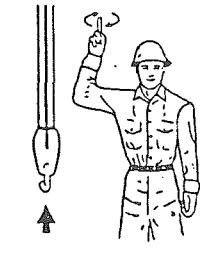
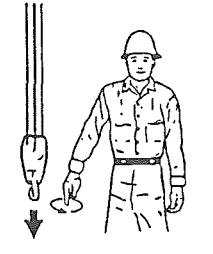
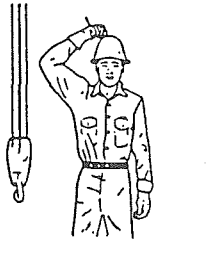
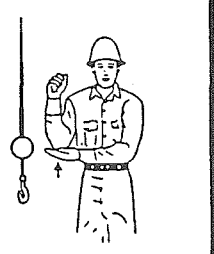
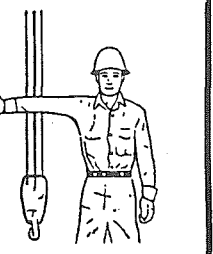
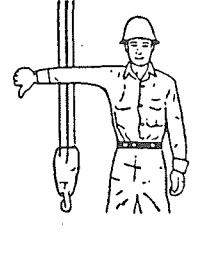
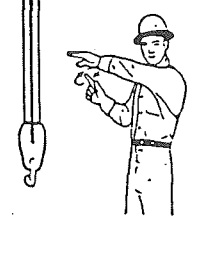
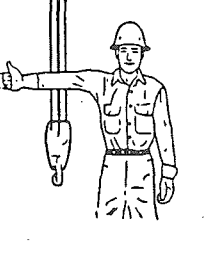
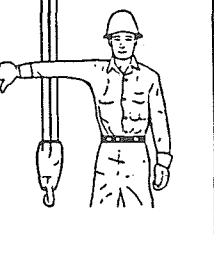
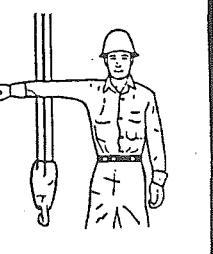
- When moving cranes, shovels or similar types of equipment across thoroughfares or railroad tracks and the operator does not have a clear vision of approaching traffic, a flagperson must be used.

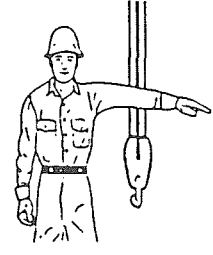
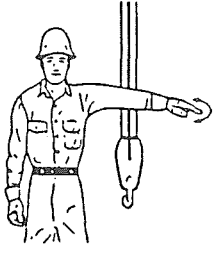
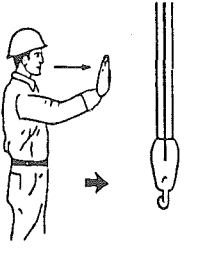
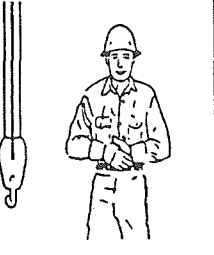

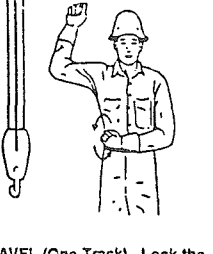
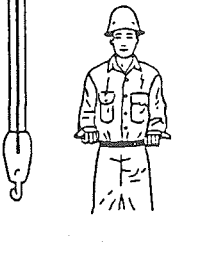
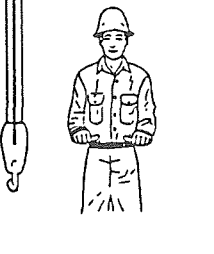
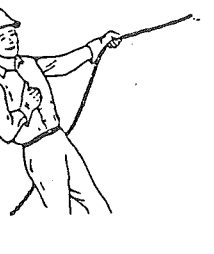
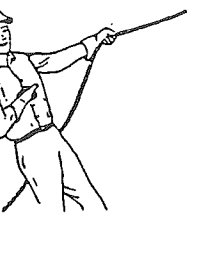
- The flag person must be stationed where the equipment operator can be signaled and other traffic can be controlled.

(18) Only a designated member of the crew may give signals to the crane operator. Exception: Anyone may give an emergency stop signal.

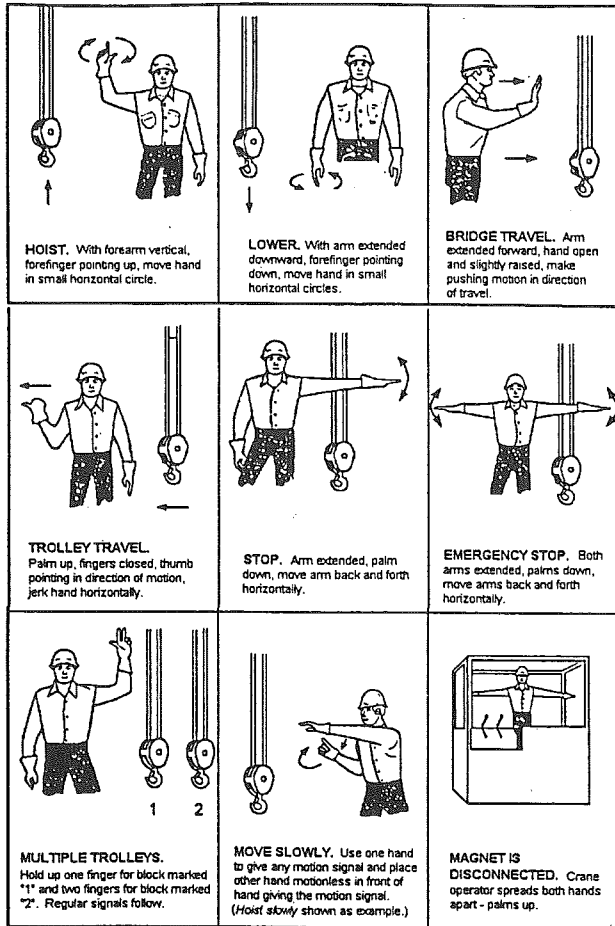
(19) Standard hand signals. When using visual signals, standard hand signals as illustrated, must be used for direct crane operators.

CRAWLER, LOCOMOTIVE, AND TRUCK CRANES
STANDARD HAND SIGNALS FOR CRANES

 <p>HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.</p>	 <p>LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.</p>	 <p>USE MAIN HOIST. Tap fist on head; then use regular signals</p>	 <p>USE WHIPLINE. (Auxiliary Hoist). Tap elbow with one hand; then use regular signals.</p>	 <p>RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.</p>
 <p>LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.</p>	 <p>MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)</p>	 <p>RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.</p>	 <p>LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.</p>	 <p>SWING. Arm extended, point with finger in direction of swing of boom.</p>

 <p>STOP. Arm extended, palm down, hold position rigidly.</p>	 <p>EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.</p>	 <p>TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.</p>	 <p>DOG EVERYTHING. Clasp hands in front of body.</p>	 <p>TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel; forward or backward. (For crawler cranes only.)</p>
 <p>TRAVEL (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For crawler cranes only.)</p>	 <p>EXTEND BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing outward.</p>	 <p>RETRACT BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.</p>	 <p>EXTEND BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.</p>	 <p>RETRACT BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.</p>

STANDARD HAND SIGNALS FOR CONTROLLING OVERHEAD AND GANTRY CRANES



[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-170, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240. 81-13-053 (Order 81-9), § 296-79-170, filed 6/17/81. Statutory Authority: RCW 49.17.040, 49.17.240, and chapters 43.22 and 42.30 RCW. 81-03-007 (Order 80-31), § 296-79-170, filed 1/8/81; Order 74-24, § 296-79-170, filed 5/6/74; Order 70-6, § 296-79-170, filed 7/10/70, effective 8/10/70.]

WAC 296-79-180 Privately owned standard gauge railroad operations. (1) Blue flag or light for railroad operations.

- A blue signal (blue flag or blue light for nonilluminated areas) must be displayed at one or both ends of an engine, car(s), or train, to indicate that workers are under or about the railway equipment.
- When such warning devices are displayed, the equipment must not be coupled to or moved.
- On a dead end spur, a blue signal may be displayed adjacent to the switch opening while cars are being loaded or unloaded.

(2) Blue signals and derails.

- Work being carried on which subjects employees to the hazard of moving railroad equipment must be protected by blue signals and locked derails set a minimum of 50 feet from one or both ends of the worksite.

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- Where the spur track switch is less than 50 feet from the work location, the switch padlocked in the open position will take the place of the derail and the blue signal must be placed at that point.

(3) Signals unobscured. Equipment which would obscure the blue signal must not be placed on the track.

(4) Signals displayed by each maintenance crew. Each maintenance crew must display and remove its own set of blue signals.

(5) Warning device.

- A flashing warning light or other device must be installed near any opening which leads to a passageway crossing railroad tracks adjacent to the building.

- Such light or device must be activated prior to any switching or movement of railroad equipment to warn workers of the dangerous condition in the area.

(6) Cars to be immobilized. Spotted cars must either have brakes set, wheels blocked, or must be coupled to other immobilized cars to prevent each car from rolling.

(7) Crawling under or between coupled cars prohibited. Workers must not crawl under or pass between coupled railroad cars to cross tracks.

(8) Warning at road crossing. An audible whistle, horn or bell must be sounded by the locomotive engineer to give adequate warning prior to switching across any road crossing.

(9) Flying switches. When switching railroad equipment in congested areas or across roadways or walkways "flying switches" must be prohibited.

(10) Car opening devices. All box car doors and associated mechanisms must be carefully inspected before workers attempt to open or close them. If the door is not free and cannot be opened safely by hand, equipment must be provided, where necessary, and a safe method must be used to open or close the door.

(11) Clearance from railroad tracks. Materials must not be stacked or piled closer than 8 1/2' from the center line of a standard gauge railroad track.

(12) Operating under limited visibility conditions.

Unless trains are operated in a manner to allow the operator to see a safe stopping distance in the direction of travel, a flagperson(s) must be positioned in such a manner to safely direct movement of the train.

Flagperson must:

- Remain within sight of the operator, or
- Be equipped to maintain visual or voice communication with the operator as conditions dictate.

(13) A flagperson must direct the movement of trains being moved across main roads or thoroughfares which do not have adequate traffic warning lights, bells or barricades.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-180, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.040, 49.17.240, and chapters 43.22 and 42.30 RCW. 81-03-007 (Order 80-31), § 296-79-180, filed 1/8/81; Order 74-24, § 296-79-180, filed 5/6/74; Order 70-6, § 296-79-180, filed 7/10/70, effective 8/10/70.]

WAC 296-79-190 Loading and unloading materials from railway cars or trucks. (1) Safe access to top of railroad cars or trucks. Platforms with ladders or stairways must be installed or made available when needed so that workers may safely gain access to and perform work on the top of rail-

road cars or trucks when ladders are not installed on such equipment.

(2) Nets not to cover ladders. Rolled chip nets must not be positioned where they cover the ladders on railroad cars or trucks.

(3) Tipple type unloading device. When a tipple type unloading device is used for removing chips from cars, the cars must be properly secured in place and all employees must be in the clear before dumping operation is started.

(4) Handling pulp chips and hog fuel from trucks and trailers.

(a) Elevating platform-type or cable-lift type unloading devices must have adequate back bumper stops.

(b) Side rails or other positive means to prevent the trailer from falling must be used while unloading single trailer units.

(c) The truck or tractor must be secured when elevating platform lifts are used to elevate both the tractor and trailer or single unit trucks.

(d) All personnel must be clear of all hoisting or elevating mechanisms before dumping commences.

(e) No person is allowed in any truck while the truck is being elevated.

(5) Taking chip samples. A safe area and suitable device must be provided for the chip tester to use while taking chip samples.

(6) Derail required for hazardous materials. To protect tank cars from being moved while loading or unloading hazardous materials by use of pipes or hoses, a derail and blue flag must be set between the spotted tank cars and any moving railroad equipment.

(7) Moving cars by tugger or powered drums. When rail cars are moved by a tugger or powered drums with cables, a means should be provided or the area barricaded in such a manner that the moving cables do not endanger the workers.

(8) Handling pulpwood from flatcars and all other railroad cars.

(a) Railroad flatcars for the conveyance of pulpwood loaded parallel to the length of the car must be equipped with safety-stake pockets.

(b) Where pulpwood is loaded crosswise on a flatcar sufficient stakes of sizes not smaller than 4 by 4 inches must be used to prevent the load from shifting.

(c) Cutting stakes on log bundles. When it is necessary to cut stakes:

- Those on the unloading side should be partially cut through first, and then the binder wires cut on the opposite side.

- Wire cutters equipped with long extension handles must be used.

- No person is permitted along the dumping side of the car after the stakes have been cut.

(d) Cutting bands on log bundles. When cutting bands on bundled logs, workers must:

- Position themselves in a safe location;

- Not use double bitted axes for cutting bands;

- Use caution to prevent being struck by ends of bands being cut and;

- If needed, wear personal protective equipment.

(e) Flatcars and all other cars must be:

- Chocked during unloading and,

- Rail clamping chocks must be used when equipment is not provided with hand brakes.

(9) Handling pulpwood from trucks.

(a) Cutting of stakes and binder wires must be done in accordance with (8)(c) of this section.

(b) Binders or stakes must not be loosened or removed:

- Until the logs are secured and held by equipment which will prevent them from rolling off the truck, or

- Barricades will prevent logs from striking the person removing the binders or stakes.

(c) Where binder chains and crane slings are used:

- The crane slings must be attached and taut before the binder chains are released and,

- The hooker must see that the helper is clear before signaling for the movement of the load.

(d) The truck driver must:

- Leave the truck cab and remain in the clear, preferably in a designated area, and

- Be in clear view of the unloading equipment operator while the unloader is approaching the loaded truck.

- After a complete load is lifted as a unit and held stationary, the truck driver may enter the cab and drive forward from under the suspended load.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-190, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-190, filed 5/6/74; Order 70-6, § 296-79-190, filed 7/10/70, effective 8/10/70.]

WAC 296-79-200 Bridge and dock plates. Properly constructed bridge or dock plates must be furnished and used to bridge the area between a dock and truck or railroad car. The following requirements must be complied with for construction and use of such bridge or dock plates:

(1) Strength. The plate must be capable of supporting three times the maximum load to which it will be subjected.

(2) Stops. The plates must be provided with positive stops to prevent the plates from shifting or moving.

(3) Plates.

- The plates must bear solidly on the dock and on the floor of the car or truck.

- Plates with excessive teeter or rock must be repaired or replaced.

(4) Upturn or lip on plates. The sides of bridge or dock plates must have an upturn or lip of at least 4 inches covering the area between the edge of the loading dock and edge of car or truck floor whenever this distance exceeds 18 inches to prevent wheeled equipment from running off the sides.

(5) Bearing surface. Bridge or dock plates must have at least 6 inches bearing surface on the loading dock.

(6) Suitable fittings to be used. Bridge or dock plates intended to be moved by mechanized equipment must be designed for this purpose or appropriate fittings or attachments must be used.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-200, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-200, filed 5/6/74; Order 70-6, § 296-79-200, filed 7/10/70, effective 8/10/70.]

WAC 296-79-210 For conveyors, maintenance and inspection. See chapter 296-24 WAC, Part D.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-16-083, § 296-79-210, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-210, filed 5/6/74; Order 70-6, § 296-79-210, filed 7/10/70, effective 8/10/70.]

WAC 296-79-220 Deactivating and lockout requirements. (1) Control requirement. Whenever the unexpected startup of machinery, the energizing of electrical circuits, the flow of material in piping systems or the removal of guards would endanger workers, such exposure must be prevented by deactivating and locking out the controls as required by chapter 296-24 WAC, Part A-4.

EXCEPTION: In instances where any machine must be in motion for proper adjustment, for removal or replacement of materials from the machine, for machine clothing changes or for roping up, the following precautions must be observed:

- The machine must be operated at thread or jog speed;
- Extension tools which minimize personnel exposure must be used where possible;
- The operating controls must at all times be under the control of a qualified operator or craftsman;
- All personnel must remain in view of the operator or other means of communication shall be established;
- All personnel must be beyond the reach of other machine section(s) or element(s) which offer potential exposure. In any instance where such potential exposure exists, such other section(s) or element(s) must be separately locked out.

(2) Group lockout or tagout devices. Procedures must meet the minimum requirements of chapter 296-24 WAC, Part A-4. The employer must develop a specific written group lockout or tagout procedure and review it with the local plant labor/management safety committee before it can be utilized.

(3) Temporary or alternate power.

- Whenever possible, temporary or alternate sources of power to the equipment being worked on must be avoided.
- If the use of such power is necessary, all affected employees must be informed and the source of temporary or alternate power must be identified.

(4) Deactivating piping systems.

(a) Nonhazardous systems must be deactivated by at least locking out either the pump or a single valve.

(b) Lockout of the following hazardous material piping systems must isolate to the worksite and must provide protection against backflow where such potential exists:

- Gaseous systems that are operated at more than 200 psig;
- Systems containing any liquid at more than 500 psig;
- Systems containing any material at more than 130°F;
- Any cryogenic system,
- Systems containing material which is chemically hazardous as defined by NFPA 704 1996 Class 3 and 4;
- Systems containing material classified as flammable or explosive as defined in NFPA Class I.

Such systems must be deactivated by one of the following:

- Locking out both the pump and one valve between the pump and the worksite;
- Locking out two valves between the hazard source and the worksite;
- Installing and locking out a blank flange between the hazard source and worksite. When a blank flange (blind) is used to separate off portions of hazardous material systems from a portion which is in operation, the employer must develop and implement a procedure for installation and removal of the blank flange that will ensure all hazards have been eliminated;
- Line breaking between the hazard and the worksite;
- On hazardous chemical systems where the methods already listed are not feasible, or by themselves create a hazard, single valve closure isolation may be used provided that potentially exposed employees are adequately protected by other means such as personal protective equipment.
- On all steam systems where the methods already listed are not feasible, single valve closure isolation may be used provided that the system is equipped with valves meeting all requirements of ANSI B16.5-1996 and ANSI B16.34-1996. Where single valve isolation is used, the steamline must also be equipped with a bleed valve downstream from the valve closure to prove isolation of the worksite.

Note: Bleeder valves are recommended behind all primary valve closures on hazardous material systems. Consideration should be given to the nature of the material in the system when installing bleeder valves. To assist in preventing plugging, bleeder valves should generally be installed in the top one-third of the pipe. Short exhaust pipes should be installed on bleeder valves to direct the flow of possible escapement away from the position where an employee would normally be when using the bleeder valve.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-16-083, § 296-79-220, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.040, 49.17.050 and 49.17.240, 81-13-053 (Order 81-9), § 296-79-220, filed 6/17/81. Statutory Authority: RCW 49.17.040, 49.17.240, and chapters 43.22 and 42.30 RCW, 81-03-007 (Order 80-31), § 296-79-220, filed 1/8/81; Order 76-7, § 296-79-220, filed 3/1/76; Order 74-24, § 296-79-220, filed 5/6/74; Order 70-6, § 296-79-220, filed 7/10/70, effective 8/10/70.]

WAC 296-79-230 Confined spaces. (1) Entry into confined spaces must be in accordance with chapter 296-62 WAC, Part M.

(2) All equipment necessary to perform the work, including safety equipment, must be at the confined space and must be inspected or tested to assure that it functions properly.

(3) Protective equipment that will afford proper protection to the employee from any condition which may arise based on the hazard assessment, must be available either at the entrance or within the confined space.

(4) Electrical circuits leading into confined spaces where electrical conductive hazards exist must be protected by a ground fault interrupter or the voltage must not exceed 24 volts.

(5) Battery operated flashlights or lantern must be readily available for use by persons working in areas where escape would be difficult if normal lighting system should fail. Only explosion-proof type lights may be taken into any atmosphere which may contain an explosive concentration.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050, 99-16-083, § 296-79-230, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-

230, filed 5/6/74; Order 70-6, § 296-79-230, filed 7/10/70, effective 8/10/70.]

WAC 296-79-240 Storage of fuel, oil, flammables and chemicals. See chapter 296-24 WAC, Part E.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-240, filed 8/3/99, effective 11/3/99; Order 76-7, § 296-79-240, filed 3/1/76; Order 74-24, § 296-79-240, filed 5/6/74; Order 70-6, § 296-79-240, filed 7/10/70, effective 8/10/70.]

WAC 296-79-250 Safety procedure for handling sulfur. (1) Sulfur burners. Sulfur-burner houses must:

- Be safely and adequately ventilated, and
- Every precaution taken to guard against dust, explosion hazards and fires, in accordance with American National Standards Z9.2-1979 (R1991).

(2) Handling/storage of dry sulfur.

(a) Nonsparking tools and equipment must be used in handling dry sulfur.

(b) Sulfur storage bins must be kept free of sulfur dust accumulation, and buildings should be designed with explosion relief, in accordance with the latest revision of American National Standard Z9.2-1979 (R1991).

(c) Sulfur-melting equipment must not be located in the burner room.

(3) Handling/storage of liquid sulfur.

(a) Each facility utilizing liquid sulfur must:

- Carefully examine its own handling system and
- Formulate a written procedure for maintenance, receiving, storing and using this product.

(b) A minimum of two trained employees must be assigned when a tank car is first opened in preparation for venting and unloading.

(c) Approved respiratory protective equipment for H₂S exposure, chemical splash goggles and gloves must be worn when performing this work.

(d) Spark producing or electric operated tools must not be used to unplug railroad car vents.

(e) Where venting can cause harmful exposure to other unprotected workers in the area:

- A venting system must be installed which adequately contains any gas escapement from a tank car while venting.
- The vented gas must be carried to a safe location for discharge or circulated through a scrubbing system.
- The venting system must be connected before valves which would allow escapement are opened.

(f) Smoking, open burning or welding must be prohibited while unloading is in process or danger of gas escapement exists.

(4) Acid plant - Protection for employees.

(a) Where lime slaking takes place, employees must be provided with rubber boots, rubber gloves, protective aprons, and eye protection. A deluge shower and eyewash must be provided to flush the skin and eyes to counteract lime and acid burns.

(b) Hoops for acid storage tanks must be:

- (i) Made of round rods rather than flat strips, and
- (ii) Regularly inspected and safety maintained.

(c) Sulphur burner ignitors must have a means to automatically shut off the fuel to the ignitor when the flame has been extinguished.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-250, filed 8/3/99, effective 11/3/99. Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-79-250, filed 11/22/91, effective 12/24/91; Order 76-7, § 296-79-250, filed 3/1/76; Order 74-24, § 296-79-250, filed 5/6/74; Order 70-6, § 296-79-250, filed 7/10/70, effective 8/10/70.]

WAC 296-79-260 Pulpwood storage and handling.

(1) Piling of logs.

- Logs must be piled or removed in an orderly manner.
- The piles must be stable and individual logs properly placed to prevent them from rolling or falling.
- The ends must not project into walkways, roadways or areas reserved for other purposes and
- Sufficient clearance must be maintained for safe travel of all vehicles and loads.

(2) Wire rope doglines used for towing or rafting must not be used when:

- They acquire jaggars to the extent that they present a hazard to the employees handling them; or
- When they are weakened to the extent that they are hazardous.

(3) Boom sticks must be capable of safely supporting the weight imposed upon them.

(4) Stiff booms must be:

- Made by fastening not less than two boom sticks together.
- Not less than 36 inches in width measured from outside to outside of the outer logs.

• Fastened together with not less than 4 inch by 6 inch cross ties or cable lashing properly recessed into notches in the boom sticks and secured.

(5) Pike poles must be kept in good repair. Conductive pike poles must not be used when it is possible that they may come in contact with electrical conductors.

(6) Logs must not be lifted over employees and employees must stay clear of the hazardous area near where logs are being lifted or swung.

(7) Storing or sorting on water or any boom work other than boom boat operations, must require a minimum of two persons.

(8) All mobile equipment used to handle logs, blocks or cants must be provided with adequate overhead protection.

(9) Unloading lines must be so arranged that it is not necessary for the worker to attach them on the pond or dump side of the load.

(10) Unauthorized vehicles and unauthorized foot traffic must not be allowed in any active sorting, storing, loading, or unloading areas.

(11) Log unloaders must not be moved about the premises with loads raised higher than absolutely necessary.

(12) Jackets or vests of fluorescent or other high visibility material must be worn by persons working on dry land log storage.

(13) All log dumps must be periodically cleared of bark and other debris.

(14) Handles of wood hooks must be locked to the shank to prevent them from rotating.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-260, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-260, filed 5/6/74; Order 70-6, § 296-79-260, filed 7/10/70, effective 8/10/70.]

WAC 296-79-270 Pulpwood preparation. (1) Barker feeding devices must be designed in such a manner that the operator will not be required to hold or make any physical contact with any log or bolt during the barking operations.

(2) A dog or locking device in addition to the motor switch, clutch, belt shifter or other power disconnecting device must be installed on all intermittent barking drums to prevent the drum from moving while it is being filled or emptied.

(3) Hydraulic barkers.

(a) The inlet and outlet areas of hydraulic barkers must be equipped with baffles or devices that will reasonably prevent material from flying out while the machine is in operation.

(b) The operator must be protected by at least five-ply laminated glass or material of equivalent strength.

(4) The high pressure hoses of hydraulic barkers must be secured in such a manner that the hose connection ends will be restrained if a hose connection fails.

(5) The feed operator's station must not be in direct line with the chipper blades. Suitable safeguards must be installed to prevent chips or chunks from being thrown out and striking the person feeding the machine.

(6) When the operator cannot readily observe the material being fed into the chipper, a mirror or other device must be installed in such a position that the ingoing material can be monitored.

(7) Metal bars or other nonchippable devices must not be used to clear jams or plug-up at the feed entrance to a chipper or hog while the machine is running.

(8) Water wheel speed governor.

- Water wheels, when directly connected to marker disks or grinders, must be provided with speed governors, if operated with gate wide open.

- Water wheels directly connected to pulp grinders must be provided with speed governors limiting the peripheral speed of the grinder to that recommended by the manufacturer.

(9) Knot cleaners of the woodpecker type.

- The operators of knot cleaners of the woodpecker type must wear eye protection equipment.

- Such knot cleaners should be enclosed to protect passersby from flying chips.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-270, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-270, filed 5/6/74; Order 70-6, § 296-79-270, filed 7/10/70, effective 8/10/70.]

WAC 296-79-27003 Log hauls, slips, and carriages.

(1) Controls must be:

- Arranged to operate from a position where the operator will at all times be in the clear of logs, machinery, lines, and rigging.

- Marked to indicate their function.

(2) Log decks must be provided with effective means to prevent logs from accidentally rolling down the deck and onto the carriage or its runway.

(3) When needed for protection of personnel, an automatic stop or interlocking device must be installed on log hauls or slips. These devices are not a substitute for lockout.

(4) A barricade or other positive stop of adequate strength must be provided to protect the sawyer from rolling logs.

(5) Canting gear or other equipment must not hang over the log deck in such a manner as to endanger employees.

(6) The sawyer shall be primarily responsible for the safety of the carriage crew and offbearers and must exercise due care in the operation of the carriage and log turning devices.

(7) Feed works and log turning control levers must be so arranged that they may be secured when not in use and must be adequately guarded against accidental activation.

(8) A control device must be provided so that the sawyer may stop the head rig section of the mill without leaving the stand.

(9) An effective method of disengaging the head rig saws from the power unit must be installed on all head rigs where the power unit is not directly controlled by the sawyer.

(10) The sawyer must be safeguarded either by location or by use of substantial screens or approved safety glass.

(11) Carriages upon which employees are required to work must be solidly decked over and the employees properly protected.

(12) The feed control lever of friction or belt-driven carriage feed works must be designed to operate away from the saws or carriage track.

(13) A substantial stop or bumper must be installed at each end of the carriage run.

(14) Substantial sweeps must be installed in front of each carriage wheel. Such sweeps must extend to within 1/4 inch of the rails.

(15) Where power-operated log turners are used, carriage knees must be provided with goosenecks or other substantial means of protecting the carriage crew.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-27003, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-27003, filed 5/6/74.]

WAC 296-79-27005 Band saws. (1) Band saws must be given a thorough daily inspection and any deficiency reported and corrected.

(2) Any band saw found to have developed a crack greater than one-tenth the width of the saw must be:

- Removed from service until the width of the saw is reduced to eliminate the crack,

- The cracked section is removed, or

- The development of the crack is arrested by welding.

(3) Band saws must not be continued in use on the head rig for which they have been designed after they have been reduced 40% in width.

(4) Band saw guides must be maintained in good condition and proper alignment at all times.

(5) All head band saw wheels must have a minimum rim thickness of 5/8 inches, except for a distance not to exceed one inch from the front edge of the wheel.

(6) Band saws must not be run at a speed in excess of the manufacturer's recommendations.

(7) A band wheel that has developed a crack in the rim must be immediately removed from service. If a crack has developed in a spoke, the wheel must be removed from service until properly repaired.

(8) All band wheel guards must be constructed of not lighter than ten U.S. Gauge metal, or not less than two-inch wood material or equivalent, attached to substantial frames. Necessary ventilating ports, not larger than two by four inches, and suitable doors or gates for the lubrication and repair of the saw will be permitted.

(9) Every band mill must be equipped with a saw catcher, rest or guard of substantial construction.

(10) Each gang ripper of band or straight saw type must have the cutting edges of the saw guarded by a hood or screen substantially secured to the framework of the machine.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-27005, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-27005, filed 5/6/74.]

WAC 296-79-27007 Circular saws speeds and repairs. (1) Circular saws must not be operated at speeds in excess of those specified by the manufacturers.

(2) Circular saws must be inspected for cracks each time the teeth are filed or set. They must be discontinued from use until properly repaired when found to have developed a crack exceeding the safe limits specified by the manufacturer.

(3) Damaged saws must be repaired only by persons experienced and knowledgeable in this type of work or by a manufacturers representative.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-27007, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-27007, filed 5/6/74.]

WAC 296-79-27009 Slasher saws-tables. (1) Slasher saws must be guarded in accordance with WAC 296-79-030(3) of this chapter.

(2) Saws must be stopped and locked or tagged out whenever it is necessary for any person to be on the slasher table.

(3) Saws below table where not protected by the frame of the machine, the underside of the slasher saws must be adequately guarded.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-27009, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-27009, filed 5/6/74.]

WAC 296-79-27011 Circular swing saws. (1) Each circular swing saw must be provided with a hood guard that completely encloses the upper half of the saw.

(2) Each swing saw must be equipped with a positive stop at the extent of the swing necessary to cut the material.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-27011, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-27011, filed 5/6/74.]

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WAC 296-79-27013 Drag saws—Fixed chain saws—Circular cut-off saws. (1) Saws must be so arranged that they will not project into any passageway when in an idle or working position. When existing conditions do not leave clear passage the saws must be fenced off in order to make it impossible for anyone to walk into them.

(2) Log decks must be equipped with a device to hold the material stable when being cut.

(3) Drag saws and fixed chain saws must be equipped with a device that will safely lock them in an "up" position.

(4) All persons must be in the clear before starting operations.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-27013, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-27013, filed 5/6/74.]

WAC 296-79-27015 Construction and use of pulp-wood splitters. (1) The activating control unit for a splitter must be of the clutch or positive acting type and must be so arranged and designed that it will not repeat without additional activation before starting a second cycle.

(2) The base or rest upon which the wood seats while being split must have a corrugated surface or other means shall be provided which will prevent the wood block or log from shifting as the pressure is applied.

(3) The splitter base or rest and wood to be split must be free of ice, snow, and chips.

(4) The splitter machine operator must have a clear, unobstructed view of the work area adjacent to the splitting operation when other workers must be in such area while blocks are being split.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-27015, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-27015, filed 5/6/74.]

WAC 296-79-280 Chip and hog fuel storage. (1) Entry into bins and silos.

(a) Entry into chip bins and silos, must be in compliance with the requirements of confined space entry, WAC 296-79-230, of this chapter.

(b) Chip and sawdust bins. Steam or compressed air lances, or other safe methods, must be used for breaking bridges and hangups.

(c) Employees must be prohibited from working under or on top overhangs or bridges. Extreme care must be taken to prevent chips or hog fuel from creating an overhang or bridging.

(d) Hog fuel bins must be provided with an approved railed platform or walkways near the top or other approved means must be provided for use of employees engaged in dislodging hog fuel.

(2) Exterior chip and hog fuel storage.

(a) When mobile equipment is used on top of hog fuel or chip piles, a roll-over protection system must be installed on the equipment.

(b) If the cab is of the enclosed type, windshield wipers must be installed.

(c) If used during hours of darkness the area must be adequately illuminated or the equipment must have adequate

lights to provide the operator sufficient illumination to safely perform the work.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-280, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-280, filed 5/6/74; Order 70-6, § 296-79-280, filed 7/10/70, effective 8/10/70.]

WAC 296-79-290 Stock preparation and reprocessing.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-290, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-290, filed 5/6/74; Order 70-6, § 296-79-290, filed 7/10/70, effective 8/10/70.]

WAC 296-79-29001 Digester valves and piping. (1)

The blow valve of a digester must be arranged so as to be operated from another room, remote from safety valves.

(2) Heavy duty pipe, valves, and fittings must be used between the digester and blow pit, blow tanks and dumptanks. These valves, fittings, and pipes must be inspected at least semiannually to determine the degree of deterioration and should be replaced when necessary.

(3) Digester blow valves or controls must be pinned or locked in closed position throughout the entire cooking period.

(4) Test holes in blow lines of piping systems must not be covered with insulation or other materials.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29001, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29001, filed 5/6/74.]

WAC 296-79-29003 Warning of digester being blown. (1) Procedures must be developed to ensure that digester operators are aware of personnel entering hazardous areas.

- Audible warning signals and red warning lights must be installed in areas which may be hazardous to personnel while digesters are being blown.

- Such devices must be activated prior to blowing a digester and the warning lights must remain lighted as long as the hazard exists.

(2) Blowing digester. Blow-off valves must be opened slowly.

(3) After the digester has started to be blown, the blow-off valve must be left open, and the hand plate must not be removed until the person responsible signals the blow-pit person that the blow is completed. Whenever it becomes necessary to remove the hand plate to clear stock, operators must wear eye protection equipment and protective clothing to guard against burns from hot stock.

(4) Blow-pit hoops must be maintained in a safe condition.

(5) Where the processes of the sulfate and soda operations are similar to those of the sulfite processes, the standard of WAC 296-79-29001 and 296-79-29003, of this chapter, applies to both processes.

(6) Means must be provided so the digester cook can signal the employee in the chip bin before starting to load the digester.

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[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29003, filed 8/3/99, effective 11/3/99; Order 77-12, § 296-79-29003, filed 7/11/77; Order 76-7, § 296-79-29003, filed 3/1/76; Order 74-24, § 296-79-29003, filed 5/6/74.]

WAC 296-79-29005 Unplugging quick lime stoppages. Water must not be used to unplug quick lime stops or plugs in pipes or confined spaces.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29005, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29005, filed 5/6/74.]

WAC 296-79-29007 Bleach plant. (1) Work areas used for preparation and processing of bleaching mixtures must be equipped with properly designed exhaust ventilation systems capable of clearing the area of toxic gases. See chapter 296-62 WAC, Part H and Part L.

(2) Bleaching containers, such as cells, towers, etc., except the Bellmer type, must be completely covered on the top, with the exception of one small opening large enough to allow filling but too small to admit a person.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29007, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29007, filed 5/6/74.]

WAC 296-79-29009 Audible alarm in bleach plant. An audible alarm system must be installed and it must be activated whenever a serious leak or break develops in the bleach plant area which creates a health or fire hazard.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29009, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29009, filed 5/6/74.]

WAC 296-79-29011 Pocket grinder doors. Doors of pocket grinders must be so designed and arranged as to keep them from closing accidentally.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29011, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29011, filed 5/6/74.]

WAC 296-79-29013 Pulping device procedures. Each company must develop a safe procedure which shall be followed for feeding, clearing jams, or removing foreign objects from any pulping device. These procedures must comply with applicable provisions of this standard.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29013, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29013, filed 5/6/74.]

WAC 296-79-29015 Off machine repulping devices. (1) When fed manually from the floor above, conveniently located emergency stop devices must be provided at the top level.

(2) When fed from floor above:

- The chute opening, if less than standard guardrail height from the feed platform or floor, must be provided with a complete guardrail or other enclosure to standard guardrail height.

- Openings for manual feeding must be sufficient only for entry of stock and must be provided with at least two per-

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manently secured crossrails, in accordance with, the general safety and health standards, WAC 296-24-75003.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29015, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29015, filed 5/6/74.]

WAC 296-79-29017 Pulping device cleaning, inspection and repairing. When cleaning, inspecting or performing other work that requires that persons enter pulping devices, all control devices must be locked or tagged out in accordance with the requirements of this standard.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29017, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29017, filed 5/6/74.]

WAC 296-79-29021 Shredders and blowers. (1) On manually fed broke shredders, the feed table must be of a height and distance from the knives as to prevent the operator from reaching or falling into the knives or the operator must be safeguarded by other acceptable means.

(2) A smooth-pivoted idler roll resting on the stock or feed table must be provided in front of feed rolls except when arrangements prevent the operator from standing closer than 36 inches to any part of the feed rolls.

(3) Any manually fed cutter, shredder, or duster must be provided with an idler roll as specified in (2) of this section or the operator shall use special hand-feeding tools.

(4) Blowers used for transporting materials must be provided with feed hoppers having outer edges located not less than 48 inches from the fan.

(5) The blower discharge outlets and work areas must be arranged to prevent material from falling on workers.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29021, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29021, filed 5/6/74.]

WAC 296-79-29023 Clearing shredder jams. To clear jams or blockage to the machine, the operator must use objects which will not create a hazard. The use of metal bars for such purposes is prohibited.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29023, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29023, filed 5/6/74.]

WAC 296-79-29027 Guillotine type roll splitters. (1) The engaging control for activating the guillotine blade must be a "deadman type" switch that demands continuous operator activation and must be:

- A positive two-hand operating control, or
- Located far enough from the cutting location so that the operator cannot reach the blade during the cutting process.

(2) Personnel must not position any part of the body under the blade.

(3) Rolls must be in the horizontal position while being split.

(4) Rolls must be centered directly below the blade.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29027, filed 8/3/99, effective 11/3/99; Order 76-7, § 296-79-29027, filed 3/1/76; Order 74-24, § 296-79-29027, filed 5/6/74.]

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WAC 296-79-29029 Broke hole. (1) An alarm bell or flashing light must be actuated or other suitable warning must be given before dropping material through a broke hole when persons working below may be endangered.

(2) Broke holes must be guarded to the fullest extent possible consistent with operational necessities. The degree of guarding provided by standard height and strength guardrails will be considered as a minimum acceptable level of protection.

(3) When repulping devices or feed conveyor systems for repulping devices are located beneath broke holes, special precautions must be used.

- The broke hole opening must be reduced to the smallest practical dimension.

- If the broke hole opening is large enough to permit a worker to fall through and is not guarded at least to the equivalent degree of protection provided by standard guardrails, any employee pushing broke down the broke hole must wear a safety belt or harness attached to a lanyard, and

- The lanyard must be fastened in such a manner that it is impossible for the person to fall into the repulping device.

(4) Guarding to the equivalent degree of protection provided by standard guardrails and meeting the requirements of subsections (2) and (3), may be achieved by the use of guard bars separated no more than 15-1/2 inches in a vertical plane and 12 inches in a horizontal plane, or any other location within that segment.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29029, filed 8/3/99, effective 11/3/99. Statutory Authority: RCW 49.17.040, 49.17.240, and chapters 43.22 and 42.30 RCW. 81-03-007 (Order 80-31), § 296-79-29029, filed 1/8/81; Order 74-24, § 296-79-29029, filed 5/6/74.]

WAC 296-79-29031 Industrial kiln guns and ammunition. The employer must ensure that there are written instructions, including safety procedures, for storing and operating industrial kiln guns and ammunition. All personnel working with this equipment must be instructed in these procedures and must follow them.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29031, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29031, filed 5/6/74.]

WAC 296-79-29033 Chlorine dioxide system. See chapter 296-62 WAC, Part P and chapter 296-67 WAC, process safety management.

(1) Sodium chlorate.

(a) Personnel handling and working with sodium chlorate must be thoroughly instructed in precautions to be used in handling and special work habits.

(b) Facilities for storage and handling of sodium chlorate must be constructed so as to eliminate possible contact of dry or evaporated sodium chlorate with wood or other material which could cause a fire or explosion.

(c) Sodium chlorate facilities should be constructed with a minimum of packing glands, stuffing boxes, etc.

(2) Chlorine dioxide.

Chlorine dioxide generating and storage facilities must be placed in areas which are adequately ventilated and are easily kept clean of wood, paper, pulp, etc., to avoid contamination which might cause a reaction. This can be accom-

plished by placing these facilities in a separate room or in a designated outside space.

(3) General.

(a) Facilities handling sodium chlorate and chlorine dioxide must be declared "no smoking" areas and must have signs posted accordingly.

(b) Management shall be responsible for developing written instructions including safety procedures for operating and maintaining the generator and associated equipment. All personnel working on this equipment must be thoroughly trained in these procedures and must follow them. A periodic review of these procedures is recommended.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29033, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29033, filed 5/6/74.]

WAC 296-79-29035 Piling and unpling pulp. (1)

Piles of wet lap pulp (unless palletized) must be stepped back one-half the width of the sheet for each 8 feet of pile height. Sheets of pulp must be interlapped to make the pile secure. Pulp must not be piled over pipelines to jeopardize pipes, or so as to cause overloading of floors, or to within 18 inches below sprinkler heads.

(2) Piles of pulp must not be undermined when being unplied.

(3) Floor capacities must be clearly marked on all floors.

(4) When sprinklers are used for fire protection in the storage area, baled paper and rags must be stored in stable piles which do not extend into the area necessary for the proper function of sprinkler systems.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29035, filed 8/3/99, effective 11/3/99; Order 76-7, § 296-79-29035, filed 3/1/76; Order 74-24, § 296-79-29035, filed 5/6/74.]

WAC 296-79-29037 Chocking rolls. Rolls must be secured by chocks or other means to prevent movement when stored horizontally.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-29037, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-29037, filed 5/6/74.]

WAC 296-79-300 Machine room equipment and procedures. (1) Pulp and paper machines must be equipped with emergency stopping control(s) which can be actuated quickly from all normal operating stations. If useful for the safety of personnel, the stopping control(s) must be interlocked with adequate retarding or braking action to stop the machine as quickly as is practical. The devices must consist of push buttons for electric motive power (or electrically operated engine stops), pull cords connected directly to the prime mover, control clutches, or other devices.

(2) Steps and footwalks along the fourdrinier/forming and press section must have nonslip surfacing and be complete with standard handrails, when practical.

(3) If a machine must be lubricated while in operation an automatic lubricating device must be provided or oil cups and grease fittings must be provided which can be serviced safely without exposing the worker to any hazards.

(4) All levers carrying weights must be so constructed that weights will not slip or fall off.

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(5) Guarding inrunning nip points.

(a) The drums on pulp and paper machine winders.

(i) These drums must be provided with suitable guards to prevent a person from being caught between the roll and the front drum on the winder when the pinch point is on the operator's side.

(ii) Such guards must be interlocked with the drive mechanism to prevent the winder from running while the guard is not in place. Except that the winder may be wired to allow it to run at thread or jog speed only for adjustment and start-up purposes while the guard is not in position.

(iii) A zero speed switch or locking device must be installed to prevent the guard from being removed while the roll is turning above thread or jog speed.

(b) Rewinders.

When rewinding large rolls and the nip point is adjacent to the normal work area.

- The nip point must be protected by a barrier guard and

- Such guard must be interlocked with the drive mechanism to prevent operating the machine above thread or jog speed without the guard in place and

- A zero speed switch must be installed to prevent the guard from being raised while the roll is turning.

(c) Inrunning nips where paper is not being fed into a calender must be guarded.

(6) An audible alarm must be sounded prior to starting up any section of a pulp or paper machine. Sufficient time must be allowed between activation of the alarm system and start-up of the equipment to allow any persons to clear the hazardous area.

(7) When starting up a dryer section, steam to heat the drums must be introduced slowly and while the drums are revolving.

(8) A safe method must be used when starting paper into the nip of drum type reels or calender stacks. This may be accomplished by the use of feeder belts, carrier ropes, air carriage or other device or instrument.

- A rope carrying system should be used wherever possible at points of transfer, or

- Sheaves should be spaced so that they do not create a nip point with each other and the sheave and its support should be capable of withstanding the speed and breaking strength of the rope for which they are intended.

(9) Employees must not feed a stack with any hand held device which is capable of going through the nip.

(10) Employees must not attempt to remove a broken carrier rope from a dryer while the section is running at operating speed.

(11) Employees must stop the dryer to remove a wrap except in cases where it can be safely removed by using air or other safe means.

(12) To remove deposits from rolls, a specially designed scraper or tool shall be used. Scraping of rolls must be performed on the outgoing nip side.

(13) Doctor blades.

(a) Cleaning. Employees must not place their hands between the sharp edge of an unloaded doctor blade and the roll while cleaning the doctor blade.

(b) Doctor blades must have the sharp edges properly guarded during transportation and storage.

(c) Special protective gloves must be provided and must be worn by employees when filing or handling sharp edged doctor blades.

(14) Handling reels.

(a) Reels must stop rotating before being lifted away from reel frame.

Crane hooks must not be used to stop a turning reel.

(b) Exposed rotating reel shafts with square block ends must be guarded.

(c) The crane operator must ascertain that reels are properly seated at winder stand or at reel arms before they disengage the hooks.

(d) On stored reels, a clearance of at least 8 inches between the reels of paper must be maintained.

(15) All winder shafts must be equipped with a winder collar guide. The winder must have a guide rail to align the shaft for easy entrance into the opened rewind shaft bearing housing. If winder shafts are too heavy for manual handling, mechanical equipment must be used.

(16) Shaftless winders must be provided with a barrier guard of sufficient strength and size to confine the rolls in the event they become dislodged while running.

(17) All calender stacks and spreader bars must be grounded according to chapter 296-24 WAC, Part L as protection against shock induced by static electricity.

(18) Nonskid type surface required.

(a) All exposed sole plates between dryers, calenders, reels, and rewinders must have a nonskid type surface.

(b) A nonskid type surface must be provided in the work areas around the winders or rewinders.

(19) If a powered roll ejector is used it should be interlocked to prevent accidental actuation until the receiving platform or roll lowering table is in position to receive the roll.

(20) Employees must keep clear of hazardous areas around the lowerator, especially all lowerator openings in a floor and where roll is being discharged.

(21) Provision must be made to hold the rider roll when in a raised position unless counterbalancing eliminates the hazard.

(22) Drain openings in pits. Flush floor drain openings larger than 3 inches in diameter in the bottom of pits must be guarded to prevent workers from stepping through, while working in this area.

(23) Employees must not enter into or climb on any paper machine roll that is subject to free turning unless a positive locking device has been installed to prevent the roll from turning.

(24) The employer must ensure sufficient inspection and nondestructive examination of reel spool and calender roll journals. The type and frequency of testing must be adequate to detect indications of failure. Any reel spool or calender roll journal found to have an indication of failure must be removed from service. Nondestructive examination personnel must be qualified in accordance with SNT-TC 1A.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-300, filed 8/3/99, effective 11/3/99. Statutory Authority: Chapter 49.17 RCW. 91-24-017 (Order 91-07), § 296-79-300, filed 11/22/91, effective 12/24/91. Statutory Authority: RCW 49.17.040, 49.17.240, and chapters 43.22 and 42.30 RCW. 81-03-007 (Order 80-31), § 296-79-300, filed 1/8/81; Order 76-7, § 296-79-300, filed 3/1/76; Order 74-

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24, § 296-79-300, filed 5/6/74; Order 70-6, § 296-79-300, filed 7/10/70, effective 8/10/70.]

WAC 296-79-310 Converting operations (bag and container manufacturing, printing, coating, finishing and related processes).

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-310, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-310, filed 5/6/74; Order 70-6, § 296-79-310, filed 7/10/70, effective 8/10/70.]

WAC 296-79-31001 General requirements for converting operations (bag and container manufacturing, printing, coating, finishing and related processes). (1)

Guillotine-type trimmers must be designed in a manner which will require the operator to use both hands simultaneously to activate the cutting blade. If machine helpers are employed in the control function of the cutter, separate two-hand controls must be provided for the control function performed by the helper.

(2) Guillotine-type trimmers must be designed in a manner that the trimming blade will not repeat unless manually reactivated.

(3) Sorting and counting tables must be smooth and free from splinters, with edges and corners rounded.

Paddles must be smooth and free from splinters.

(4) Devices (i.e., mirrors) must be installed to assist the converting machine operator in viewing blind work stations where a hazard exists.

(5) Mechanical lifting devices must be provided for placing and removing rolls from rewinders. Rolls must not be left suspended overhead while the controls are unattended.

(6) When using a crane or hoist to place rolls into a backstand and the operator cannot see both ends of the backstand, assistance will be provided or appropriate devices will be installed to eliminate the hazards involved. The operator must ascertain that rolls are properly seated at winder stand or at roll arms before disengaging the hooks.

(7) Slitters, slotters, and scorers not in use must be properly stored so a hazard is not created.

(8) All power closing sections must be equipped with an audible warning system which will be activated when closing the sections.

(9) Roll-type embosser. The nipping point located on the operator's side must be guarded by either automatic or manually operated barrier guards interlocked with the drive.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-31001, filed 8/3/99, effective 11/3/99; Order 76-7, § 296-79-31001, filed 3/1/76; Order 74-24, § 296-79-31001, filed 5/6/74.]

WAC 296-79-31003 Corrugator. (1) Every recessed floor conveyor system must be identified by standard color coding, and so designed and installed to minimize tripping hazards.

(2) All areas subject to wet processes must be provided with drains.

• Drain trenches must be provided with gratings flush with the adjoining floor.

• Use of curbing in work areas should be avoided in new installations. If the use of curbing cannot be avoided, the

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design must be such that the curbs do not constitute a tripping hazard in normal working areas. When curbing exists and constitutes a hazard, it must be color coded.

(3) Rails of rail mounted devices such as roll stands must be flush with the adjacent floor, and so installed to provide a minimum of 18 inches clearance between the equipment and walls or other fixed objects.

(4) All corrugating and pressure rolls must be equipped with appropriately designed and installed threading guides so as to prevent contact with the infeed nip of the various rolls by the operator.

(5) A minimum of 4 inches clearance or effective nip guarding must be maintained between heated drums, idler rolls, and cross shafting on all preheaters and preconditioners.

(6) Lower elevating conveyor belt rolls on the single facer bridge must have a minimum nip clearance of 4 inches or effective nip guarding.

(7) Web shears at the discharge end of the double facer must be equipped with barrier type guards.

(8) Slitter stations not in use must be disconnected from the power source by positive means.

(9) Elevating type conveyors must have the floor area color-coded.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-31003, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-31003, filed 5/6/74.]

WAC 296-79-31009 Die cutting. Bobst type die cutters.

A minimum of 4 inches must be provided between the end of the slat and the guide bar.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-31009, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-31009, filed 5/6/74.]

WAC 296-79-320 Sulfite recovery furnace area requirements. (1) The employer must have a program to train all personnel associated with recovery boiler operations in safe operating procedures and emergency shutdown procedures.

(2) An audible warning system must be installed in kraft and soda base sulfite recovery furnace areas and must be actuated whenever an emergency exists.

(3) All personnel who enter the recovery furnace area must understand the emergency evacuation procedure.

(4) Warning system maintenance. Emergency warning systems in the recovery furnace areas must be kept in proper working condition and must be tested or checked weekly.

(5) Personnel must stand to the side while opening a furnace or boiler firebox door.

[Statutory Authority: RCW 49.17.010, [49.17].040 and [49.17].050. 99-16-083, § 296-79-320, filed 8/3/99, effective 11/3/99; Order 74-24, § 296-79-320, filed 5/6/74; Order 70-6, § 296-79-320, filed 7/10/70, effective 8/10/70.]

[Title 296 WAC—p. 1962]

Chapter 296-86A WAC

REGULATIONS AND FEES FOR ALL ELEVATORS, DUMBWAITERS, ESCALATORS AND OTHER LIFTING DEVICES

(Formerly chapter 296-86 WAC)

WAC

296-86A-010	Do I need a permit to construct, alter or relocate a conveyance?
296-86A-020	When I apply for my construction, alteration or relocation permit, what permit fees will I have to pay?
296-86A-025	When I apply for my material lift installation, alteration or relocation permit, what permit fees will I have to pay?
296-86A-028	Are the construction and alteration permit fees that I pay refundable?
296-86A-030	What installation permit fees will I have to pay for personnel and material hoists?
296-86A-040	Do I need to submit my plans for new installations and alterations to the department for approval?
296-86A-060	What annual operating permit fees will I have to pay?
296-86A-065	Can I replace annual operating permits that have been damaged, lost or stolen?
296-86A-070	Can I obtain a supplemental inspection from the department?
296-86A-073	Can I obtain technical services from the department's elevator section?
296-86A-074	Can I request an inspection outside of the department's normal work hours?
296-86A-075	Do I pay a fee when my conveyance is inspected?
296-86A-080	Is there a fee for inspecting regular elevators used as temporary personnel elevators?

WAC 296-86A-010 Do I need a permit to construct, alter or relocate a conveyance? (1) You must obtain a permit from the department **before** you begin constructing, altering or relocating any conveyance. To obtain your permit, you need to complete the department's permit application and pay a fee. (Consult the appropriate fee schedules in this chapter.) Once your application is approved **and** your fee is paid, your permit will be issued and work on your project can begin.

(2) Your construction and alteration permits are valid for one year from the date of issue. However, construction and alteration permits can be renewed if you:

(a) Apply for a renewal permit **before** your current permit expires; and

(b) The department approves your request for a renewal permit; and

(c) You pay a one-dollar renewal fee to the department for each permit you renew.

(3) You **are not required** to obtain permits and pay fees for the following:

(a) Repairs and replacement normally necessary for maintenance and made with parts of equivalent materials, strength and design.

(b) Any conveyance exempted by RCW 70.87.200.

[Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-010, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-020 When I apply for my construction, alteration or relocation permit, what permit fees will I have to pay? The following permit fees apply to all conveyances **except for material lifts**:

TOTAL COST	FEE
\$250.00 TO AND INCLUDING \$1,000	\$ 30.50
\$1,001 TO AND INCLUDING \$15,000	
For the first \$1,001	43.00
For each additional \$1,000 or fraction thereof	8.50
\$15,001 TO AND INCLUDING \$100,000	
For first \$15,001	165.25
For each additional \$1,000 or fraction thereof	5.50
OVER \$100,001	
For first \$100,001	694.50
For each additional \$1,000 or fraction thereof	4.50

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-020, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-020, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-025 When I apply for my material lift installation, alteration or relocation permit, what permit fees will I have to pay? The following permit fees apply to the installation, alteration and relocation of material lifts:

TOTAL COST	FEE
\$250.00 TO AND INCLUDING \$1,000	\$ 28.00
\$1,001 TO AND INCLUDING \$15,000	
For the first \$1,001	39.25
For each additional \$1,000 or fraction thereof	7.75
\$15,001 TO AND INCLUDING \$100,000	
For first \$15,001	150.25
For each additional \$1,000 or fraction thereof	5.00
OVER \$100,001	
For first \$100,001	631.50
For each additional \$1,000 or fraction thereof	4.00

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-025, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-025, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-028 Are the construction and alteration permit fees that I pay refundable? Your construction and alteration permit fees are refundable **unless your permits have expired. If your permits have expired, no refunds for these permits will be issued to you.** All requests for refunds must be addressed to the elevator section in writing and must identify the specific permits for which refunds are being requested. In those cases where you are entitled to a refund, the department will charge you a twenty-six-dollar processing fee for each refund you request.

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-028, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-028, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-030 What installation permit fees will I have to pay for personnel and material hoists? For each

personnel hoist or material hoist you install, you will have to pay an installation fee of one hundred one dollars and seventy-five cents.

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-030, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-030, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-040 Do I need to submit my plans for new installations and alterations to the department for approval? You must submit all new installation plans and plans for major alterations to the department for approval. Your plans must be submitted, in duplicate, to the elevator section **prior to the start of construction.** To be approved, they must comply with the latest edition of the American Society of Mechanical Engineers (ASME) A17.1, National Electrical Code (NEC) and applicable Washington Administrative Codes (WAC) adopted by the department. In addition, your plans must include all information pertinent to determining whether each installation/alteration complies with all applicable codes. Once approved, a copy of your plan must be kept on your job site until all acceptance tests have been witnessed by the department. **Any alterations to your approved plan must be submitted to the department for approval before a final inspection will be conducted.** The nonrefundable fees for reviewing your plans are:

For each installation/major alteration	\$ 22.25
If more than two sets of plans are submitted, the fee for reviewing each additional set	22.25

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-040, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-040, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-060 What annual operating permit fees will I have to pay? No annual operating permit will be issued to you until you have paid an appropriate fee to the department. The following is a schedule of those fees.

TYPE OF CONVEYANCE	ANNUAL OPERATING PERMIT FEE
Each hydraulic elevator	\$ 78.75
Each roped-hydraulic elevator	101.75
plus \$ 7.75 for each hoistway opening in excess of two	7.75
Each cable elevator	101.75
plus \$ 7.75 for each hoistway opening in excess of two	7.75
Each cable elevator traveling more than 25 feet without an opening - \$ 10.75 for each 25 foot traveled without openings	10.75
Each limited-use/limited-application elevator	78.75
Each sidewalk freight elevator	78.75
Each hand-powered manlift or freight elevator	50.75
Each incline elevator in other than a private residence	101.75
Each belt manlift	78.75

TYPE OF CONVEYANCE	ANNUAL OPERATING PERMIT FEE
Each boat launching elevator	78.75
Each auto parking elevator	78.75
Each escalator	78.75
Each moving walk	78.75
Each dumbwaiter in other than a private residence	50.75
Each people mover	67.50
Each stair lift in other than a private residence	50.75
Each wheel chair lift in other than a private residence	50.75
Each special purpose elevator	78.75
Each personnel hoist	78.75
Each grain elevator personnel lift	78.75
Each material hoist	78.75
Each casket lift	78.75
Each material lift	67.50
Each inclined stairway chair lift in private residence	16.50
Each inclined wheel chair lift in a private residence	22.25
Each vertical wheel chair lift in a private residence	28.00
Each inclined elevator at a private residence	78.75
Each dumbwaiter in a private residence	22.25
Each private residence elevator	50.75
Each private residence elevator installed in other than a private residence	78.75

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-060, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-060, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-065 Can I replace annual operating permits that have been damaged, lost or stolen? If you have already paid for a current operating permit under WAC 296-86A-060, you may purchase a replacement permit by paying the department's five-dollar replacement permit fee for each permit being replaced. No replacement permit will be issued until this replacement fee has been received by the department.

[Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-065, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-070 Can I obtain a supplemental inspection from the department? Any person, firm, corporation or governmental agency can obtain a supplemental inspection from the department by paying a fee of two hundred ninety-one dollars and fifty cents per day plus the standard per diem and mileage allowance granted to department inspectors.

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-070, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-070, filed 5/29/98, effective 6/30/98.]

[Title 296 WAC—p. 1964]

WAC 296-86A-073 Can I obtain technical services from the department's elevator section? You can obtain elevator field technical services from the department by paying a fee of fifty-six dollars and twenty-five cents per hour plus the standard per diem and mileage allowance granted to department inspectors. These field technical services may include code evaluation, code consultation, plan examination, code interpretation and clarification of technical data relating to the application of the department's conveyance rules. **Field technical services do not include inspections.**

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-073, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-073, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-074 Can I request an inspection outside of the department's normal work hours? You may request an inspection outside of normal work hours, which are 7:00 a.m. to 5:00 p.m., if an inspector is available and the inspection is authorized by the department. However, the fee for such an inspection is seventy dollars and seventy-five cents per hour plus the standard per diem and mileage allowance granted to department inspectors. This fee is in addition to any other fees required for your project.

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-074, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-074, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-075 Do I pay a fee when my conveyance is inspected? Not necessarily, some inspections do not require a fee. For example, the initial annual inspection of a conveyance does not require one. Neither does the **initial inspection** of any conveyance constructed, altered or relocated. The following table explains which inspections do require a fee:

INSPECTION	FEE
If a conveyance does not pass an initial inspection and a second inspection (reinspection) is required, the fee for each conveyance inspected*	\$ 78.75
If a third inspection (reinspection) is required, the fee for each conveyance inspected*	101.75

***These "reinspection" fees are in addition to the fees charged under WAC 296-86A-020, 296-86A-025 and 296-86A-030 and must be paid before an annual operating permit will be issued.**

The department may waive reinspection fees when it is not possible to conduct the inspection and the inability to inspect is not the fault of the party requesting and/or paying for the inspection.

The department may also waive reinspection fees for reasons of justice and equity which prevent their payment.

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-075, filed 5/28/99, effective 6/28/99. Statutory Authority:

Chapter 70.87 RCW. 98-12-043, § 296-86A-075, filed 5/29/98, effective 6/30/98.]

WAC 296-86A-080 Is there a fee for inspecting regular elevators used as temporary personnel elevators? Yes, the fee for inspecting and testing regular elevators used as temporary personnel elevators is sixty-seven dollars and fifty cents. This fee is in addition to any other fees required in this chapter.

This sixty-seven dollar and fifty cent fee purchases a thirty-day temporary use permit which may be renewed at the discretion of the department. When this temporary use permit is purchased, a notice declaring that the equipment has not been finally approved must be conspicuously posted on the elevator.

[Statutory Authority: Chapters 43.22, 18.27, 70.87 and 19.28 RCW. 99-12-080, § 296-86A-080, filed 5/28/99, effective 6/28/99. Statutory Authority: Chapter 70.87 RCW. 98-12-043, § 296-86A-080, filed 5/29/98, effective 6/30/98.]

Chapter 296-96 WAC

SAFETY REGULATIONS AND FEES FOR ALL ELEVATORS, DUMBWAITERS, ESCALATORS AND OTHER CONVEYANCES

(Formerly chapters 296-81, 296-82, 296-84, 296-85, 296-87, 296-89, 296-91, 296-93A, 296-94, 296-95, and 296-100 WAC)

WAC

PART A - ADMINISTRATIVE

- 296-96-00500 Scope, purpose, and authority.
- 296-96-00600 What rules apply to your conveyance?
- 296-96-00650 Which National Elevator Codes and Supplements has the department adopted?
- 296-96-00700 Chapter definitions.
- 296-96-00800 Advisory committee on conveyances.

PART B - REGULATIONS AND FEES FOR ALL ELEVATORS, DUMBWAITERS, ESCALATORS AND OTHER CONVEYANCES

NOTE: Total fees include the sum of the permit cost plus plan check fees.

- 296-96-01000 What is the permit process for conveyances?
- 296-96-01005 When do I need a permit?
- 296-96-01010 What are the permit fees for conveyances other than material lifts and hoists and how are they calculated?
- 296-96-01015 What are the permit fees for material lifts and how are they calculated?
- 296-96-01025 What is the permit fee for personnel and material hoists?
- 296-96-01027 Are initial installation permit fees refundable?
- 296-96-01030 What is the process for installation and alteration plan approval?
- 296-96-01035 Are there inspection fees?
- 296-96-01040 What is the fee for testing and inspecting regular elevators used as temporary personnel elevators?
- 296-96-01045 What are the inspection requirements and fees for conveyances in private residences?
- 296-96-01050 How do I get a supplemental inspection?
- 296-96-01055 Are technical services available and what is the fee?
- 296-96-01060 Can I request an after hours inspection and what is the fee?
- 296-96-01065 What are the annual operating permits fees?
- 296-96-01070 Are there penalties?
- 296-96-01080 How do you appeal a notice of violation?

PART C - REGULATIONS FOR NEW AND ALTERED ELEVATORS AND LIFTING DEVICES

NOTE: The following rules set the minimum standard for all new installations and, where applicable, alterations.

- 296-96-02240 Where is a shut-off valve required for hydraulic elevators?
- 296-96-02275 What are the requirements for Phase I recall?
- 296-96-02277 How does the department enforce ASME requirements for sprinklers, smoke detectors, and heat detectors in hoistways and machine rooms?
- 296-96-02278 Are keys required to be onsite?
- 296-96-02280 Can pipes and ducts be installed above a machine room?
- 296-96-02281 What is required for emergency escape hatches?
- 296-96-02300 Are self-leveling devices required?
- 296-96-02306 Is a door reopening device required on automatic-closing car doors?
- 296-96-02310 What is the minimum acceptable initial transfer time for an elevator door?
- 296-96-02315 What are the structural requirements for car interiors?
- 296-96-02320 What is required for car controls?
- 296-96-02325 What are the location and operation requirements for car position indicators in the car?
- 296-96-02330 What is required for installation and operation of emergency communication systems?
- 296-96-02340 What requirements apply to the size and location of car handrails?
- 296-96-02350 What requirements apply to floor designations on elevator door jams?
- 296-96-02355 What are the installation and operation requirements for hall buttons?
- 296-96-02360 What are the requirements for installation and operation of hall lanterns?
- 296-96-02365 What is required for physically handicapped lifts?

Material Lifts

- 296-96-05010 What are the department's rules on material lifts?
- 296-96-05020 What requirements apply to the construction and fire safety of hoistway enclosures?
- 296-96-05030 What are the construction requirements for hoistway enclosure gates and doors?
- 296-96-05040 What requirements apply to a hoistway that does not extend to the lowest levels of a building or structure?
- 296-96-05050 What requirements apply to lift hoist driving machines?
- 296-96-05070 What car enclosure requirements apply to lifts?
- 296-96-05080 How much running clearance is permitted between a car sill and a hoistway?
- 296-96-05090 What requirements apply to car and counterweight guides?
- 296-96-05100 How much weight can be placed on a car frame and platform during loading and unloading?
- 296-96-05120 What requirements apply to car operating devices, terminal stopping devices and electrical protective devices?
- 296-96-05140 What requirements apply to car safeties?
- 296-96-05150 What requirements apply to lift brakes?
- 296-96-05160 What types of ropes, chains, and rope connections must be used on a lift?
- 296-96-05170 What requirements apply to lift control stations?
- 296-96-05190 How must lift pits be constructed?
- 296-96-05200 Which lift landings must be illuminated?
- 296-96-05210 What signs must be posted on landings and lifts?
- 296-96-05220 What electrical wiring standards apply to lifts?
- 296-96-05230 What safety regulations apply to exposed equipment?
- 296-96-05240 What are the minimum maintenance requirements for lifts?
- 296-96-05260 When are inspections required?
- 296-96-05290 Under what conditions is a five-year test administered?

PART C1 - CONSTRUCTION, OPERATION, MAINTENANCE AND INSPECTION OF INCLINED PRIVATE RESIDENCE CONVEYANCE FOR TRANSPORTING PERSON(S) FOR RESIDENTIAL USE

- 296-96-07010 What is the scope of these regulations?
- 296-96-07020 What is the definition for inclined private residence elevator?
- 296-96-07030 Does the department approve private residence elevator plans and specifications?
- 296-96-07035 What are the minimum maintenance requirements for inclined private residence elevators?
- 296-96-07040 What are the clearance requirements for an incline runway?
- 296-96-07050 What are the construction requirements for car landing enclosures and gates for inclined private residence elevators?

296-96-07060	What types of bumpers and buffers must be installed on inclined private residence elevators?		
296-96-07070	What are the requirements for machinery beams and supports?		
296-96-07080	What are the load and size requirements for car platforms?		
296-96-07090	What is the maximum rated speed of an incline elevator?		
296-96-07100	What construction requirements apply to incline elevators?		
296-96-07110	What construction requirements apply to car enclosures?		
296-96-07120	What construction requirements apply to car doors and gates?		
296-96-07130	What type of glass or plastic can be used in a car enclosure?		
296-96-07140	Are capacity and data plates required?		
296-96-07150	What are the construction requirements for guide rails, track supports and fastenings?		
296-96-07160	What construction requirements apply to counterweights?		
296-96-07170	What are the requirements of safeties and governors?		
296-96-07171	How and when are safeties and governors tested?		
296-96-07180	What are the construction requirements for driving machines and sheaves?		
296-96-07190	What construction requirements apply to terminal stopping switches?		
296-96-07200	What are the requirements for operation of an inclined private residence elevator?		
296-96-07210	What are the construction requirements for suspension methods?		
296-96-07220	What are the requirements for traveling cables?		
296-96-07230	What requirements apply to electrical wiring?		
296-96-07240	What are the requirements for track supporting structures?		
296-96-07250	What additional requirements apply to inclined private residence elevators?		
PART C2 - CONSTRUCTION, OPERATION, MAINTENANCE AND INSPECTION OF PRIVATE RESIDENCE CONVEYANCES FOR TRANSPORTING PROPERTY FOR RESIDENTIAL USE			
296-96-08010	What is the scope of these regulations?		
296-96-08020	What is the definition for inclined private residence elevator for transporting property?		
296-96-08030	Does the department approve elevators plans and specifications?		
296-96-08035	What are the minimum maintenance requirements for inclined private residence elevators for transporting property?		
296-96-08050	What are the construction requirements for inclined private residence elevator for transporting property for cars, landing gates, and enclosures?		
296-96-08060	What types of bumpers and buffers must be installed on inclined private residence elevators for transporting property?		
296-96-08070	What are the requirements for machinery beams and supports?		
296-96-08080	What are the load and size requirements for car platforms?		
296-96-08090	What is the maximum rated speed of an incline elevator?		
296-96-08100	What requirements apply to incline elevators?		
296-96-08110	What requirements apply to car enclosures?		
296-96-08140	Are capacity and data plates required on inclined private residence elevator for transporting property?		
296-96-08150	What are the requirements for guide rails, track supports and fastenings?		
296-96-08160	What requirements apply to counterweights?		
296-96-08170	What are the requirements of safeties and governors?		
296-96-08175	How and when are elevator safeties tested?		
296-96-08180	What are the requirements for driving machines and sheaves?		
296-96-08190	What requirements apply to terminal stopping switches?		
296-96-08200	What are the requirements for operation of an inclined private residence elevators for transporting property?		
296-96-08210	What are the requirements for suspension methods?		
296-96-08220	What are the requirements for traveling cables?		
296-96-08230	What requirements apply to electrical wiring?		
296-96-08240	What are the requirements for track supporting structures?		
296-96-08250	What additional requirements apply to inclined private residence elevators for transporting property?		
PART C3 - TEMPORARY HOISTS			
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296-96-09001	What regulations apply to personnel hoists?		
296-96-09002	Can a drop plate be used for temporary hoists?		
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296-96-10001	What regulations apply to material hoists?		
PART C4 - ADDITIONAL TYPES OF CONVEYANCES			
Belt Manlifts			
296-96-11000	What regulations apply to belt manlifts after 1974?		
296-96-11001	What regulations apply to belt manlifts prior to 1974?		
296-96-11010	What are the definitions for belt manlifts?		
296-96-11016	What structural requirements apply to belt manlift landings?		
296-96-11019	What structural requirements apply to belt manlift landings?		
296-96-11022	What requirements apply to guarding lift entrances and exits?		
296-96-11025	What structural requirements apply to floor opening guards?		
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296-96-11040	What lighting requirements apply to belt manlifts?		
296-96-11045	What drive machine requirements apply to belt manlifts?		
296-96-11048	What is an acceptable operating speed for a belt manlift?		
296-96-11051	What are the construction requirements for steps?		
296-96-11054	What requirements apply to the location and construction of handholds?		
296-96-11057	What requirements apply to "up-limit stops"?		
296-96-11060	What requirements apply to emergency stops?		
296-96-11066	What are the warning sign requirements?		
296-96-11070	Can you carry tools and materials on a belt manlift?		
296-96-11078	What is required for belt manlift inspections?		
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296-96-14010	What is the scope and application of the department's hand-powered manlift rules?		
296-96-14020	What construction requirements apply to hoistway landings and entrances?		
296-96-14025	What are acceptable hoistway clearances?		
296-96-14030	Can there be a habitable space beneath an elevator hoistway or counterweight shaft?		
296-96-14035	What construction requirements apply to hoistway guide rails?		
296-96-14040	What installation requirements apply to buffer springs?		
296-96-14045	What construction specifications apply to hoistway cars?		
296-96-14050	What are the requirements for assembly, installation, and operation of sectional counterweights?		
296-96-14055	What is the minimum acceptable sheave diameter?		
296-96-14060	What requirements apply to hoisting ropes?		
296-96-14065	What requirements apply to operating ropes?		
296-96-14070	Where must hoistway lights be located?		
296-96-14075	What is the factor of safety for overhead supports?		
296-96-14080	What additional requirements apply to the installation and operation of hand powered manlifts?		
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296-96-16010	What is the scope of the department's casket lift regulations?		
296-96-16020	What requirements apply to the location and operation of machine rooms and machinery space?		
296-96-16030	What equipment can be located in a machine room?		
296-96-16040	What requirements apply to the location of electrical wiring, pipes and ducts in hoistways and machine rooms?		
296-96-16050	Is a pit required in a casket lift hoistway?		
296-96-16060	What requirements apply to the size and location of hoistway door openings?		
296-96-16070	How must hoistway doors be hung?		
296-96-16080	Where must hoistway doors be located?		
296-96-16090	What requirements apply to hoistway doors locks?		
296-96-16100	How should space beneath a hoistway be protected?		
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	Section 7 Capacity and Loading	296-96-23309	What requirements apply to car enclosures?
296-96-23240	What is the minimum rated load for passenger elevators?	296-96-23311	What requirements apply to capacity and loading?
296-96-23241	What requirements apply to the use of partitions that reduce inside net platform area?		Section 3 Driving Machines
296-96-23243	What is the minimum rated load for freight elevators?	296-96-23313	What requirements apply to driving machine connections?
296-96-23244	What requirements apply to capacity plates?	296-96-23316	What requirements apply to plunger stops?
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	Section 8 Driving Machines and Sheaves	296-96-23318	What requirements apply to pump relief valves?
296-96-23250	What general requirements apply to driving machines and sheaves?	296-96-23321	What requirements apply to check valves?
296-96-23255	What requirements apply to winding drum machines?	296-96-23322	What requirements apply to supply piping and fittings?
296-96-23256	What requirements apply to indirect-drive machines?	296-96-23323	What requirements apply to flexible hydraulic connections?
296-96-23260	What requirements apply to driving machine brakes?		Section 5 Tanks
296-96-23261	What requirements apply to the application and release of driving machine brakes?	296-96-23324	What general requirements apply to tanks?
	Section 9 Terminal Stopping Devices	296-96-23325	What requirements apply to pressure tanks?
296-96-23262	What requirements apply to normal terminal stopping devices?		Section 6 Terminal Stopping Devices
296-96-23264	What requirements apply to final terminal-stopping devices?	296-96-23326	What requirements apply to terminal stopping devices?
	Section 10 Operating Devices and Control Equipment		Section 7 Operating Devices and Control Equipment
296-96-23266	What types of operating devices must not be used?	296-96-23328	What requirements apply to operating devices?
296-96-23268	What requirements apply to car-switch operation elevators?	296-96-23330	What requirements apply to car top operating devices?
296-96-23269	What requirements apply to passenger elevator emergency stop buttons?	296-96-23332	What requirements apply to anti-creep leveling devices?
296-96-23270	What requirements apply to car top operating devices?	296-96-23334	What requirements apply to electrical protective devices?
296-96-23272	What electrical protective devices are required?	296-96-23336	What requirements apply to power supply line disconnects?
296-96-23274	What requirements apply to the power supply line disconnect?	296-96-23338	What requirements apply to devices that make hoistway door interlocks or electric contacts and car door (gate) electric contacts inoperative?
296-96-23276	What requirements apply to phase reversal and failure protection methods?	296-96-23340	What requirements apply to control and operating circuits?
296-96-23277	What requirements apply to grounding and overcurrent protections?	296-96-23342	What requirements apply to emergency operation and signaling devices?
296-96-23278	What requirements apply to the absorption of regenerated power?		Section 8 Additional Requirements for Counterweighted Hydraulic Elevators
296-96-23279	What requirements apply to door by-pass systems?	296-96-23344	What additional requirements apply to counterweighted hydraulic elevators?
	Section 11 Emergency Operation and Signaling Devices		Subpart IV Escalators
296-96-23280	What requirements apply to all car emergency signaling devices in all buildings?	296-96-23400	What is the scope of Subpart IV, Escalators?
	Section 12 Suspension Systems and Their Connections		Section 1 Construction
296-96-23282	What requirements apply to suspension systems?	296-96-23405	What requirements apply to balustrades?
296-96-23283	What requirements apply to rope data tags?	296-96-23408	How much clearance is required between skirt panels and step treads?
296-96-23284	What is the factor of safety for wire suspension ropes?	296-96-23410	What requirements apply to guards at ceiling or soffit intersections?
296-96-23285	What is the minimum number of suspension ropes allowed?	296-96-23412	What requirements apply to anti-slide devices?
296-96-23287	What requirements apply to suspension rope equalizers?	296-96-23414	What requirements apply to handrails?
296-96-23288	What requirements apply to securing suspension wire ropes to winding drums?	296-96-23416	What requirements apply to handrail guards?
296-96-23289	What requirements apply to spare rope turns on winding drum machines?	296-96-23418	What requirements apply to step riser slotting?
296-96-23290	What requirements apply to suspension rope fastenings?	296-96-23420	What requirements apply to step tread slotting?
296-96-23291	What requirements apply to auxiliary rope fastening devices?	296-96-23422	What requirements apply to combplates?
	Subpart III Hydraulic Elevators		Section 2 Brakes
296-96-23300	What is the scope of Subpart III, Hydraulic Elevators?	296-96-23424	What general requirements apply to escalator brakes?
	Section 1 Hoistways, Hoistway Enclosures, and Related Construction	296-96-23427	What requirements apply to main drive shaft brakes?
296-96-23302	What requirements apply to hoistways, hoistway enclosures and related construction?	296-96-23429	Section 3 Operating and Safety Devices
	Section 2 Mechanical Equipment	296-96-23431	What requirements apply to starting switches?
296-96-23304	What requirements apply to buffers and bumpers?	296-96-23432	What requirements apply to emergency stop buttons?
296-96-23307	What requirements apply to car frames and platforms?	296-96-23433	What requirements apply to speed governors?
		296-96-23434	What requirements apply to broken step-chain devices?
		296-96-23436	What requirements apply to brake applications?
		296-96-23438	What requirements apply to broken drive-chain devices?
		296-96-23440	What requirements apply to skirt obstruction devices?

- 296-96-23442 What requirements apply to rolling shutter devices?
- 296-96-23444 What requirements apply to reversal stop device?
- 296-96-23446 What requirements apply to tandem operations?
- 296-96-23448 What requirements apply to caution signs?
- Section 4
- Lighting of Step Treads
- 296-96-23450 What requirements apply to step tread lighting?
- Subpart V
- Dumbwaiters and Hand-powered Elevators
- 296-96-23500 What is the scope of Subpart V, Dumbwaiters and Hand-powered elevators?
- 296-96-23510 What requirements apply to electric and electro-hydraulic dumbwaiters?
- 296-96-23540 What requirements apply to hand-power elevators and dumbwaiters?
- Subpart VI
- Alterations, Repairs and Maintenance
- 296-96-23600 What is the scope of Part VI, Alterations, Repairs and Maintenance?
- 296-96-23610 What requirements apply to routine periodic inspections and tests?
- 296-96-23620 What requirements apply to alterations, repairs and maintenance?
- 296-96-23630 What requirements apply to elevator equipment displaced by seismic activity?
- Subpart VII
- Lifts for Physically Handicapped
- 296-96-23700 What is the scope of Subpart VII, Lifts for Physically Handicapped?
- 296-96-23710 What requirements apply to lifts for the physically handicapped?
- Subpart VIII
- Sidewalk Elevators
- 296-96-23800 What is the scope of Subpart VIII, Sidewalk Elevators?
- 296-96-23810 What requirements apply to electrically-operated sidewalk elevators?

PART A - ADMINISTRATIVE

WAC 296-96-00500 Scope, purpose, and authority.

This chapter is authorized by chapter 70.87 RCW covering elevators, lifting devices, and moving walks. The purpose of this chapter is to:

(1) Provide for the safe mechanical and electrical operation, construction, installation, alteration, inspection, relocation, and repair of conveyances; and

(2) Ensure that all such operation, construction, installation, alteration, inspection, and repair subject to the provisions of this chapter will be reasonably safe to persons and property and in conformity with the provisions of this chapter and the applicable statutes of the state of Washington.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-00500, filed 12/22/00, effective 1/22/01.]

WAC 296-96-00600 What rules apply to your conveyance? Elevators and other conveyances must comply with the rules adopted by the department that were in effect at the time the conveyance was permitted unless any new rule specifically states that it applies to all elevators, regardless of when the elevator was permitted.

Please note, if the elevator is altered it must comply with all of the applicable rules adopted by the department in effect at the time the conveyance was altered.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-00600, filed 12/22/00, effective 1/22/01.]

WAC 296-96-00650 Which National Elevator Codes and Supplements has the department adopted?

NATIONAL ELEVATOR CODES AND SUPPLEMENTS ADOPTED				
TYPE OF CONVEYANCE	NATIONAL CODE AND SUPPLEMENTS	DATE INSTALLED		COMMENTS
		FROM	TO	
Elevators, Dumbwaiters, Escalators	American Standard Safety Code (ASA) A17.1, 1960	Prior to 11/1/1963		Adopted Standard Part X of ASA applies to all installations in existence prior to 11/1/63.
Elevators, Dumbwaiters, Escalators	American Standard Safety Code (ASA) A17.1, 1960	11/1/1963	12/29/1967	Adopted Standard
Moving Walks	American Safety Association A17.1.13, 1962	11/1/1963	12/29/1967	Adopted Standard
Elevators, Dumbwaiters, Escalators, and Moving Walks	U.S.A. Standards (USAS) USAS A17.1, 1965; Supplements A17.1a, 1967; A17.1b, 1968; A17.1c, 1969;	12/30/1967	2/24/1972	Adopted Standard USAS 1965 includes revision and consolidation of A17.1-1, 1960, A17.1a, 1963, and A17.1-13, 1962. Adopted code and supplements, excluding Appendix E and ANSI 17.1d, 1970.
Elevators, Dumbwaiters, Escalators, and Moving Walks	American National Standard Institute ANSI A17.1, 1971	2/25/1972	6/30/1982	Adopted Standard as amended and revised through 1971.
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1, 1971; A17.1a, 1972	2/25/1972	6/30/1982	Adopted Supplement
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1, 1981	7/1/1982	1/9/1986	Adopted Standard
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1a, 1982	3/1/1984	1/9/1986	Adopted Supplement

Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1b, 1983	12/1/1984	1/9/1986	Adopted Supplement, except portable escalators covered by Part VIII of A17.1b, 1983.
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1, 1984	1/10/1986	12/31/1988	Adopted Standard Except Part XIX. After 11/1/1988 Part II, Rule 211.3b was replaced by WAC 296-81-275.
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1a, 1985	1/10/1986	12/31/1988	Adopted Supplement
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1b, 1985; A17.1c, 1986; A17.1d, 1986; and A17.1e, 1987	12/6/1987	12/31/1988	Adopted Supplement
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1, 1987	1/1/1989	12/31/1992	Adopted Standard Except Part XIX and Part II, Rule 211.3b. WAC 296-81-275 replaced Part II, Rule 211.3b.
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1, 1990	1/1/1993	2/28/1995	Adopted Standard Except Part XIX and Part V, Section 513. Chapter 296-94 WAC replaced Part V, Section 513.
Elevators, Dumbwaiters, Escalators, and Moving Walks	ANSI A17.1, 1993	3/1/1995	6/30/1998	Adopted Standard Except Part XIX and Part V, Section 513. Chapter 296-94 WAC replaced Part V, Section 513.
Elevators, Dumbwaiters, Escalators, and Moving Walks	ASME A17.1, 1996	6/30/1998	Current	Adopted Standard Except Part V, Section 513.
Note: Copies of codes and supplements can be obtained from The American Society of Mechanical Engineers, Order Department, 22 Law Drive, Box 2900, Fairfield, New Jersey, 07007-2900 or by visiting www.asme.org .				

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-00650, filed 12/22/00, effective 1/22/01.]

WAC 296-96-00700 Chapter definitions. The following general definitions apply to this chapter:

"ANSI" means the American National Standard Institute.

"ASA" means the American Safety Association.

"ASME" means the American Society of Mechanical Engineers.

"Automobile parking elevator" means an elevator that is located in either a stationary or horizontally moving hoistway and is used exclusively for parking automobiles.

(a) During the parking process, each automobile moves onto or off of the elevator under its own power or by a power driven transfer device into parking spaces or cubicles directly in line with the elevator.

(b) Normally, no person is stationed on any level except the receiving level.

"Belt manlift" means a power-driven endless belt with steps or platforms and handholds used for the transportation of personnel from floor to floor.

"Boat launching elevator" means an elevator that:

(a) Serves a boat launching structure and a beach or water surface; and

(b) Is used for carrying or handling boats in which people ride.

"Casket lift" means a lift that:

(a) Is installed at a mortuary;

(b) Is designed exclusively for carrying caskets;

(c) Moves in guides in basically a vertical direction; and

(d) Serves two or more floors or landings.

"Code" refers to nationally accepted codes (i.e. ASME, ANSI, ASA, and NEC) and/or the Washington Administrative Code.

"Conveyance" means an elevator, escalator, dumbwaiter, belt manlift, automobile parking elevator, moving walk, as well as, other elevating devices defined in this chapter.

"Department" means the department of labor and industries.

"Director" means the director of the department or the director's representative.

"Direct-plunger hydraulic elevator" means a hydraulic elevator with a plunger or cylinder attached to the car frame or platform.

"Dumbwaiter" means a hoisting and lowering mechanism equipped with a car that:

(a) Moves in guides in substantially a vertical direction;

(b) Has a floor area that does not exceed 9 square feet;

(c) Has an inside height that does not exceed 4 feet;

(d) Has a capacity that does not exceed 500 pounds; and

(e) Is used exclusively for carrying materials.

"Electric elevator" means an elevator powered by an electric driving machine.

"Electro-hydraulic elevator" means a direct-plunger elevator where a pump driven by an electric motor pumps liquid, under pressure, directly into the cylinder.

"Elevator" means:

(1) A hoisting or lowering machine;

(2) Equipped with a car or platform that moves in guides; and

(3) Services two or more floors or landings of a building or structure.

"Escalator" means a power-driven, inclined, continuous stairway used for raising and lowering passengers.

"Freight elevator" means an elevator:

- (a) Used primarily for carrying freight; and
- (b) Whose passengers are limited to the operator, people needed to load and unload freight, and other employees approved by the department.

"Hand elevator" means an elevator where manual energy moves the car.

"Hydraulic elevator" means an elevator powered by a plunger or piston moved by pressurized liquid in a cylinder.

"Inclined elevator" means an elevator that travels at an inclined angle of 70 degrees or less from the horizontal.

"Inspector" means a department elevator inspector or an inspector in a municipality with an elevator ordinance in effect according to RCW 70.87.200.

"Limited-use/limited-application elevator (LULA)" means a powered passenger elevator whose use and application is limited by size, capacity, speed, and rise. It is principally used for vertically transporting people with physical disabilities.

"Maintained-pressure hydraulic elevator" means a direct-plunger elevator where pressurized liquid is always available for transfer into the cylinder.

"Material hoist" means a hoist that is:

- (a) Not part of a permanent structure;
- (b) Installed inside or outside buildings during construction, alteration, or demolition;
- (c) Used to raise or lower materials associated with the building project; and

"Material lift" means a lift that is not part of a conveying system and is:

- (a) Permanently installed in a commercial or industrial area;
- (b) Not accessible to the general public or intended to be operated by the general public.

"Moving walk" means a passenger-carrying device on which:

- (a) Passengers stand or walk; and
- (b) The carrying surface remains parallel to its direction of motion.

"Multi-deck elevator" means an elevator having two or more compartments located one immediately above the other.

"NEC" means the National Electrical Code.

"Observation elevator" means an elevator designed for exterior viewing by passengers while the car is traveling.

"One-man capacity manlift" means a single passenger device that:

- (a) Is either hand-powered counterweighted or electric-powered;
- (b) Travels vertically in guides; and
- (c) Serves two or more landings.

"Owner" means any person having title to or control of a conveyance, as guardian, trustee, lessee, or otherwise.

"Passenger elevator" means an elevator used to carry passengers but may also be used to carry freight or materials if the load does not exceed the capacity of the elevator.

"Permit" means a permit issued by the department to construct, alter, install, relocate, or operate a conveyance.

"Person" means an individual, this state, a political subdivision of this state, any public or private corporation, any firm, or any other entity.

"Personnel hoist" means a hoist that is:

- (a) Not part of a permanent structure;
- (b) Installed inside or outside buildings during construction, alteration or demolition;
- (c) Used to raise or lower workers and other persons associated with the building project; and
- (d) Used for the transportation of materials when necessary.

"Power elevator" means an elevator using energy, other than gravitational or manual energy, to move the car.

"Private residence conveyance" means a conveyance installed in or on the premises of a single-family dwelling and used to transport people or property from one elevation to another.

"Rack and pinion elevator" means a power elevator, with or without counterweights, supported, raised and lowered by a motor(s) driving a pinion(s) on a stationary rack mounted in the hoistway.

"Rooftop elevator" means a powered passenger or freight elevator that operates between a roof level landing and a landing below and opens, horizontally, onto a building roof.

"Roped hydraulic elevator" means a hydraulic elevator with its plunger or piston coupled to the car by wire ropes and sheaves.

"Screw column elevator" means a powered elevator with a non-counterweighted car supported, raised and lowered by a screw thread.

"Sidewalk elevator" means a freight elevator that operates between the sidewalk or other areas outside a building and the building floor levels below; and

- (a) At its upper travel limit, has no landing opening into the building; and
- (b) Is not used to carry automobiles.

"Special purpose personnel elevator" means an elevator that is limited in size, capacity, and speed and is:

- (a) Permanently installed in grain elevators, radio antennas, bridge towers, underground facilities, dams, power plants and similar structures; and
- (b) Used to vertically transport authorized personnel, their tools and equipment.

"Stairway chair lift" means a lift that travels in an inclined direction and is designed for use by disabled persons.

"USAS" means the U.S.A. Standards.

"WAC" means the Washington Administrative Code.

"Wheelchair lift" means a lift that travels in a vertical or inclined direction and is designed for use by wheelchair users.

"Workmen's construction elevator" means a permanent elevator used temporarily during construction for personnel and materials.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-00700, filed 12/22/00, effective 1/22/01.]

WAC 296-96-00800 Advisory committee on conveyances. The purpose of the advisory committee is to advise the department on the adoption of regulations that apply to conveyances; methods of enforcing and administering the elevator law, chapter 70.87 RCW; and matters of concern to the conveyance industry and to the individual installers, owners and users of conveyances. The advisory committee consists of five persons appointed by the director of the department with the advice of the chief of the elevator section. The committee members shall serve four years.

The committee shall meet on the third Tuesday of February, May, August, and November of each year, and at other times at the discretion of the chief of the elevator section. The committee members shall serve without per diem or travel expenses.

The chief of the elevator section shall be the secretary for the advisory committee.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-00800, filed 12/22/00, effective 1/22/01.]

PART B - REGULATIONS AND FEES FOR ALL ELEVATORS, DUMBWAITERS, ESCALATORS AND OTHER CONVEYANCES

NOTE: Total fees include the sum of the permit cost plus plan check fees.

WAC 296-96-01000 What is the permit process for conveyances? (1) Prior to the start of the construction, alteration, or relocation, of all conveyances (this includes both private residence and commercial conveyances) your plan must be approved by the department. See WAC 296-96-01030.

(2) Prior to construction, alteration, or relocation of any conveyance, you must get an installation permit from the department. See WAC 296-96-01010 and 296-96-01015.

(3) Your conveyance must be inspected upon completion of the construction, alteration, or relocation. See WAC 296-96-01035.

(4) You must obtain and renew an annual operating permit for each conveyance that you own, except for residential conveyances. See WAC 296-96-01065.

(5) After initial purchase and inspection private residence conveyance(s) do not require an annual permit. However, annual inspections may be conducted upon request. See WAC 296-96-01065 for the associated fees.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01000, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01005 When do I need a permit? (1) You must obtain a permit from the department before you begin constructing, altering or relocating any conveyance as described in the definitions for this chapter. To obtain your permit, you need to complete the permit application and pay the appropriate fee. Once your application is approved, a permit will be issued and you may begin work on your project.

(2) Construction and alteration permits are valid for one year from the date of issue; however, permits may be renewed if you:

(a) Apply for a renewal permit before your current permit expires;

(b) The department approves your request for a renewal permit;

(c) You pay a one-dollar renewal fee to the department for each permit you renew; and

(d) If your permit has expired you must reapply for a new permit.

(3) You are not required to obtain permits and pay fees for repairs and replacement associated with normal functions and necessary maintenance done with parts of equivalent materials, strength and design; or for any conveyance exempted by RCW 70.87.200.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01005, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01010 What are the permit fees for conveyances other than material lifts and hoists and how are they calculated? Permit fees are based on the total cost of the conveyance and labor to install. The following permit fees apply to the construction, alteration, or relocation of all conveyances except for material lifts:

TOTAL COST OF CONVEYANCE	FEE
\$250 to and including \$1,000	\$30.50
\$1,001 to and including \$15,000	
For the first \$1,001	43.00
Each additional \$1,000 or fraction thereof	8.50
\$15,001 to and including \$100,000	
For first \$15,001	165.25
For each additional \$1,000 or fraction thereof	5.50
OVER \$100,001	
For the first \$100,001	694.50
For each additional \$1,000 or fraction thereof	4.50

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01010, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01015 What are the permit fees for material lifts and how are they calculated? Permit fees are based on the total cost of the material lift and labor to install. The following fees apply to construction, alteration, or relocation of material lifts:

TOTAL COST OF MATERIAL LIFT	FEE
\$250 to and including \$1,000	\$28.00
\$1,001 to and including \$15,000	
For the first \$1,001	39.25
Each additional \$1,000 or fraction thereof	7.75
\$15,001 to and including \$100,000	
For first \$15,001	150.25
For each additional \$1,000 or fraction thereof	5.00
OVER \$100,001	
For the first \$100,001	631.50
For each additional \$1,000 or fraction thereof	4.00

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01015, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01025 What is the permit fee for personnel and material hoists? The fee for each personnel hoist or material hoist installation is \$101.75

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01025, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01027 Are initial installation permit fees refundable? Your initial installation permit fees are refundable minus a processing fee unless your permits have expired. No refunds will be issued for expired permits. All requests for refunds must be submitted in writing to the elevator section and must identify the specific permits for which the refunds are requested.

The processing fee for a refund is \$26.00

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01027, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01030 What is the process for installation and alteration plan approval? Prior to the start of construction, you must submit to the department for approval two copies of plans for new installations or major alterations. To be approved, the plan must comply with the latest adopted edition of the American Society of Mechanical Engineers (ASME) A17.1, the National Electrical Code (NEC) and applicable Washington Administrative Codes (WAC). In addition, the plans must include all information necessary in determining whether each installation/alteration complies with all applicable codes. You must keep a copy of the approved plan on the job site until the department has witnessed all acceptance tests. Any alterations to the approved plan must be submitted to the department for approval before a final inspection will be conducted. The nonrefundable fees for reviewing your plans are:

For each installation/major alteration. \$22.25
If more than two sets of plans are submitted, the fee for each additional set \$22.25

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01030, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01035 Are there inspection fees? The initial inspection of a conveyance or for the initial inspection of construction, alteration or relocation of a conveyance is included with your permit fee. Once the department has approved the conveyance you will be issued a permit that is valid for 30-days. Prior to the expiration of the 30-day permit the application for an annual operating permit and the appropriate fees must be paid to the department. Once the department has received the appropriate fees and application you will be issued your first annual operating permit. You are required to renew your annual operating permit yearly.

The following exceptions do require a fee:

RE-INSPECTION	FEE
If a conveyance does not pass an initial inspection and a second inspection is required, the fee for each conveyance re-inspected is	\$78.75
If any additional re-inspections are required, the fee for each conveyance re-inspected.	\$101.75

The department may waive re-inspection fees.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01035, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01040 What is the fee for testing and inspecting regular elevators used as temporary personnel
(2001 Ed.)

elevators? (1) The fee for the inspecting and testing of regular elevators used as temporary personnel elevators is \$67.50, in addition to any other fees required in this chapter. This fee purchases a 30-day temporary use permit that may be renewed at the department's discretion.

(2) When this temporary use permit is purchased, a notice declaring that the equipment has not received final approval from the department must be conspicuously posted on the elevator.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01040, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01045 What are the inspection requirements and fees for conveyances in private residences? (1) Chapter 70.87 RCW requires the department to inspect all new, altered or relocated conveyances operated exclusively for single-family use in private residences. Prior to inspection, you must complete a permit application as described in WAC 296-96-01005 and pay the appropriate fee listed in WAC 296-96-01010.

(2) Chapter 70.87 RCW allows the department to inspect conveyances operated exclusively for single-family use in private residences when the department is investigating an accident or an alleged or apparent violation of the statute or these rules.

(3) No annual inspection and operating permit is required for a private residence conveyance operated exclusively for single-family use unless the owner requests it. When an owner requests an inspection and an annual operating permit, the following fee must be paid prior to an inspection:

TYPE OF CONVEYANCE	FEE
Each inclined stairway chair lift in private residence	\$16.50
Each inclined wheel chair lift in a private residence	22.25
Each vertical wheel chair lift in a private residence	28.00
Each dumbwaiter in a private residence.	22.25
Each inclined elevator at a private residence.	78.75
Each private residence elevator	50.75
Duplication of a lost, damaged or stolen operating permit	5.00

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01045, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01050 How do I get a supplemental inspection? Any person, firm, corporation or governmental agency can request a supplemental inspection from the department by paying a fee of \$291.50 per day plus the standard per diem and mileage allowance granted to department inspectors.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01050, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01055 Are technical services available and what is the fee? You may request elevator field techni-

cal services from the department by paying a fee of \$56.25 per hour plus the standard per diem and mileage allowance granted to department inspectors. These field technical services may include code evaluation, code consultation, plan examination, code interpretation and clarification of technical data relating to the application of the department's conveyance rules. Field technical services do not include inspections.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01055, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01060 Can I request an after hours inspection and what is the fee? You may request an inspection outside of normal business hours, which are 7:00 a.m. to 5:00 p.m., if an inspector is available and the inspection is authorized by the department. The minimum fee for an after-hours inspection is \$70.75 per hour plus the standard per diem and mileage allowance granted to department inspectors. This fee is in addition to any other fees required for your project.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01060, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01065 What are the annual operating permits fees? An annual operating permit will be issued to you upon payment of the appropriate fee:

TYPE OF CONVEYANCE	FEE
Each hydraulic elevator	\$78.75
Each roped-hydraulic elevator	101.75
plus for each hoistway opening in excess of two	7.75
Each cable elevator	101.75
plus for each hoistway opening in excess of two	7.75
Each cable elevator traveling more than 25 feet without an opening—for each 25 foot traveled	10.75
Each limited-use/limited-application (LULA) elevator	78.75
Each escalator	78.75
Each dumbwaiter in other than a private residence	50.75
Each material lift	67.50
Each incline elevator in other than a private residence	101.75
Each belt manlift	78.75
Each stair lift in other than a private residence	50.75
Each wheel chair lift in other than a private residence	50.75
Each personnel hoist	78.75
Each grain elevator personnel lift	78.75
Each material hoist	78.75
Each special purpose elevator	78.75
Each private residence elevator installed in other than a private residence	78.75
Each casket lift	78.75
Each sidewalk freight elevator	78.75
Each hand-powered manlift or freight elevator	50.75

Each boat launching elevator	78.75
Each auto parking elevator	78.75
Each moving walk	78.75
Duplication of a damaged, lost or stolen operating permit	5.00

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01065, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01070 Are there penalties? (1) Any installer, owner or operator of a conveyance who violates a provision of chapter 70.87 RCW or these rules shall be subject to the following civil penalties:

(a) Operation of a conveyance without a permit:	
First violation	\$150.00
Second violation	300.00
Each additional violation	500.00
(b) Installation of a conveyance without a permit:	
First violation	\$150.00
Second violation	300.00
Each additional violation	500.00
(c) Relocation of a conveyance without a permit:	
First violation	\$150.00
Second violation	300.00
Each additional violation	500.00
(d) Alteration of a conveyance without a permit:	
First violation	\$150.00
Second violation	300.00
Each additional violation	500.00
(e) Operation of a conveyance for which the department has issued a red tag or has revoked or suspended an operating permit:	\$500.00
(f) Failure to comply with a correction notice:	
Within 90 days	\$100.00
Between 91 and 180 days	250.00
Between 181 and 270 days	400.00
Between 271 and 360 days	500.00
Note: Penalties cumulate	
(g) Failure to submit official written notification that all corrections have been completed:	
Within 90 days	\$100.00
Between 91 and 180 days	250.00
Between 181 and 270 days	400.00
Between 271 and 360 days	500.00
Note: Penalties cumulate	

(2) A violation as described in subsection (1)(a), (b), (c), and (d) of this section will be a "second" or "additional" violation only if it occurs within one year of the first violation.

(3) The department must use certified mail to notify the installer, owner, or operator of a violation of chapter 70.87 RCW, or these rules.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01070, filed 12/22/00, effective 1/22/01.]

WAC 296-96-01080 How do you appeal a notice of violation? A person who contests a notice of violation issued by the department may request a hearing. The request for a hearing must be:

- (1) In writing;
- (2) Accompanied by a certified or cashier's check, payable to the department, for \$200.00; and
- (3) Postmarked or received by the department within 15 days after the person receives the department's violation notice.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-01080, filed 12/22/00, effective 1/22/01.]

PART C - REGULATIONS FOR NEW AND ALTERED ELEVATORS AND LIFTING DEVICES

NOTE: The following rules set the minimum standard for all new installations and, where applicable, alterations.

WAC 296-96-02240 Where is a shut-off valve required for hydraulic elevators? Two shut-off valves may be required.

- (1) ASME requires that a shut-off valve be installed in the machine room.
- (2) When the pit is lower than the machine a shut-off valve must be installed in the pit. A separate shut-off valve is not required in the pit for hydraulic elevators equipped with a safety/rupture valve that rotates no more than 180 degrees to stop the flow of hydraulic fluid and has a safety shut-off handle capable of being grasped.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02240, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02275 What are the requirements for Phase I recall? Devices for deactivating recall must be in the line of sight of the elevator; be secure from tampering; and must be accessible to fire, inspection, and elevator service personnel only. Owner-designated patient express and emergency hospital service elevators may have a manual control in the car for use by authorized patient care personnel. When activated, it shall preclude Phase I recall.

EXCEPTION: Limited use/limited application (LULA), special purpose, and residential elevators are exempt from the Phase I recall requirement.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02275, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02277 How does the department enforce ASME requirements for sprinklers, smoke detectors, and heat detectors in hoistways and machine rooms? ASME A17.1-102.2 (c)3 states: "Means shall be provided to automatically disconnect the mainline power supply to the affected elevator prior to the application of water."

- (1) The department enforces this rule as follows:

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(a) When sprinkler systems are installed in an elevator hoistway, fixed temperature heat detectors, set only at 135°F, must be located at the top of the hoistway. If sprinklers are installed in the machine room, the same rule applies to heat detectors in the machine room. If you install heat detectors, you must also install a smoke detector for elevator recall. The purpose of these heat detectors is to automatically disconnect mainline power to the elevator before water flows from any sprinkler associated with the elevator system.

(b) Smoke detectors at the top of the hoistway shall not recall the elevator to the bottom landing.

(c) Heat detectors must be:

(i) Located near each sprinkler head as required by NFPA 13;

(ii) Considered only as an auxiliary function of elevator equipment;

(iii) Identified as "elevator controls only - DO NOT TEST"; and

(iv) Ceiling mounted. However, pit detectors, if installed, may only be used as a signaling device and wall-mounted if they are so designed.

(v) Heat detectors are not required in pits provided the automatic sprinkler heads are installed in such a way that the water spray pattern does not spray higher than three feet above the pit floor with a spray pattern directed level and down. The shunt trip disconnect must be installed in the machine room or machinery space and it must be easily identifiable.

(d) Power for the automatic disconnect control circuit must be derived from the load side of the elevator power main disconnecting means or from a 120 volt separate branch circuit. Circuit location must be identified on or next to the elevator disconnects. If a 120 volt separate branch circuit is used an illuminated visual device must be installed in the machine room adjacent to each elevator's disconnect. The purpose of this visual device is to indicate that power is available to the shunt trip activation mechanism.

(e) All electrical equipment and wiring associated with shunt trip devices must conform to the applicable ANSI/NFPA 70.

(f) The department does not require sprinkler shut-off valves. However, where they are installed, they must be located in an accessible place outside the hoistway, machine room or machinery space with their handles placed at no more than 6 feet above the floor.

(g) Emergency return units must be disabled when the shunt trip is activated.

(2) The department must approve alternative methods used to achieve ASME A17.1 – 102.2 (c)3 prior to installation.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02277, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02278 Are keys required to be onsite? Yes. The keys to the machine room that are necessary to operate the elevator must be readily available to authorized personnel.

[Title 296 WAC—p. 1975]

NOTE: The department recommends the use of a locked key retainer box in the elevator lobby at the designated level above the hall buttons or by machine room doors at no more than 6 feet above the floor. This key retainer box should be:

- Readily accessible to authorized personnel;
- Clearly labeled "Elevator"; and
- Equipped with a 1-inch cylinder cam lock key #39504.

The department further recommends that:

- Keys for access to elevator machine rooms and for operating elevator equipment are tagged and kept in the key box.
- The key box contains all keys necessary for inspection of the elevator.
- Mechanical hoistway access devices are located in the machine room.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02278, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02280 Can pipes and ducts be installed above a machine room? Electric conduit, pipes, and ducts may be installed in the upper space ("upper space" is defined as the space above the fire-rated ceiling) of the elevator machine room as long as they are installed above the required seven-foot clearance and they do not interfere with the elevator equipment which also must be installed to allow a seven-foot head clearance.

(1) Straight through runs of electrical conduit without junction boxes may be installed in this space.

(2) Pipes and ducts conveying gases, vapor, or liquids may be installed in the space above the machine room provided they are encased in a noncombustible secondary pipe without joints, or a moisture barrier without penetration.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02280, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02281 What is required for emergency escape hatches? Emergency escape hatches must be hinged and secured from the car top so that the cover opens from the top of the car only.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02281, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02300 Are self-leveling devices required? Automatic elevators must be equipped with a self-leveling device that:

- (1) Operates automatically;
- (2) Stops the car at each floor landing within a tolerance of plus or minus 1/2 inch under normal loading and unloading conditions;
- (3) Functions independently of the car's operating device;
- (4) Corrects for over-travel and under-travel; and
- (5) Always maintains the car within a tolerance of plus or minus 1/2 inch with the landing regardless of load.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02300, filed 12/22/00, effective 1/22/01.]

[Title 296 WAC—p. 1976]

WAC 296-96-02306 Is a door reopening device required on automatic-closing car doors? (1) If an elevator car door closes automatically, a door reopening device must be installed that:

- (a) Stops and reopens the car door and the adjacent hoistway door whenever the car door is obstructed while closing;
- (b) Is activated by a sensor, not physical contact;
- (c) Is capable of sensing an object or a person in the path of the closing car door; and

(2) The sensing device can be located along the entire edge of the door. When used with a manually operated device (safety edge), a minimum of two sensing devices must be installed between 5 and 29 inches above the floor.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02306, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02310 What is the minimum acceptable initial transfer time for an elevator door? "Initial transfer time" refers to the period of time between an elevator car receiving a call for service and when the car door begins to close. The minimum acceptable initial transfer time for an elevator is:

(1) For HALL CALLS, minimum acceptable initial transfer time is based upon the distance between a point in the center of the corridor or lobby (maximum 5 feet) that is directly opposite the farthest hall button controlling the car and the centerline of the hoist-way entrance. Minimum acceptable times for specific distances are:

- (a) 0-5 feet: 4 seconds;
- (b) 10 feet: 7 seconds;
- (c) 15 feet: 10 seconds; and
- (d) 20 feet: 13 seconds.

(2) For CAR CALLS, the minimum acceptable initial transfer time for doors to remain fully open is 3 seconds.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02310, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02315 What are the structural requirements for car interiors? (1) All car interiors must be constructed to allow wheelchair users to enter the car, to maneuver within reach of the control panel and to exit the car.

- (2) Minimum door width must be 36 inches.
- (3) Minimum cab depth:
 - (a) From the rear wall to the return panel must be 51 inches; and
 - (b) From the rear wall to the inside face of the cab door must be 54 inches.
- (4) For cabs with side-opening doors, the minimum cab width is 68 inches;
- (5) For cabs with center-opening doors, the minimum cab width is 80 inches; and
- (6) Maximum clearance between a car platform sill and the edge of a hoistway landing sill must be 1 1/4 inch.

EXCEPTION 1: Elevators located in school buildings or other buildings specifically identified by local authorities may have a minimum clear distance between walls or between a wall and the door, including the return panel, of 54 inches, and a minimum distance from the wall to the return panel of 51 inches.

EXCEPTION 2: LULA, special purpose, and residential elevators must meet the specifications in ASME A17.1 pertaining to car size.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02315, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02320 What is required for car controls? (1) The following requirements apply to the location of car controls:

- (a) Upon entering an elevator, at least one set of controls must be readily accessible from a wheelchair;
- (b) The centerline of the alarm button and emergency stop switch must be 35 inches;
- (c) Where a side approach is used, the highest floor buttons must be no higher than 54 inches from the floor;
- (d) Where a forward approach is used, the highest floor buttons must be no higher than 48 inches from the floor;
- (e) Emergency controls must be grouped together at the bottom of the control panel and centered at 35 inches;
- (f) Controls unessential to the elevator's operation may be located in a convenient place.

(2) The following requirements apply to the construction of control panels:

- (a) Raised or flush floor registration buttons, exclusive of the panel border, must be at least 3/4 inch and arranged from left to right in ascending order.
- (b) When pushed, the depth of flush buttons must not exceed 3/8 inch.
- (c) Indicator lights must be installed to show each call registered and they must extinguish when a call is answered.
- (d) All markings must be located to the left of and adjacent to the car controls on a contrasting color background.
- (e) All letters or numbers must be at least 5/8 inches high and must be raised .030 of an inch.
- (f) Braille must be used to identify all control buttons. Permanently attached plates are acceptable.
- (g) Standard ASME A17.1 symbols must be used to identify essential controls.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02320, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02325 What are the location and operation requirements for car position indicators in the car?

- (1) A visual car position indicator must be located either above the car control panel or above the car door.
- (2) As a car passes or stops at a floor, the corresponding floor numbers must light up and a signal must sound.
- (3) All numerals must be at least 1/2 inch high.
- (4) All audible signals must be at least 20 decibels with a frequency no higher than 1500 Hz.
- (5) The automatic announcement of a floor number may be substituted for an audible signal.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02325, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02330 What is required for installation and operation of emergency communication systems? Every elevator must contain an emergency two-way commu-

(2001 Ed.)

nication system connecting the elevator with a point outside the hoistway. The installation and operation of this emergency communication system must comply with the ASME A17.1 code in effect when the department issued the elevator's installation permit. In addition to the appropriate ASME A17.1 code, the following department requirements apply:

- (1) The maximum height of any operable part of the communication system is 48 inches above the floor.
- (2) Raised symbols and letters must identify the communication system. These symbols and letters must be located adjacent to the communication device. The characters used must be:
 - (a) At least 5/8 inches but no more than 2 inches high;
 - (b) Raised 1/32 inch;
 - (c) Upper case;
 - (d) Sans serif or simple serif type; and
 - (e) Accompanied by Grade 2 Braille.
- (3) If the system is located in a closed compartment, opening the door to the compartment must:
 - (a) Require the use of only one hand without tight grasping, pinching, or twisting of the wrist; and
 - (b) Require a maximum force of 5 pounds.
- (4) The emergency communication system must not be based solely upon voice communication since voice-only systems are inaccessible to people with speech or hearing impairments. An indicator light must be visible when the telephone is activated. This non-verbal means must enable the message recipient to determine the elevator's location address and, when more than one elevator is installed, the elevator's number.
- (5) The emergency communication system must use a line that is capable of communicating with and signaling to a person or service that can respond appropriately to the emergency at all times.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02330, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02340 What requirements apply to the size and location of car handrails? A handrail must be installed on all car walls not used for normal exits. The hand rails must be:

- (1) Attached to the wall at a height of between 32 and 35 inches from the floor.
- (2) Attached to the wall with a 1 1/2 inch space between the wall and the rail;
- (3) Constructed with the hand grip portion at least 1 1/4 inches but not more than 2 inches wide;
- (4) Constructed with a cross-section shape that is substantially oval or round;
- (5) Constructed with smooth surfaces and no sharp corners.

Approaching handrail ends on a blank wall in the interior corners of a car do not have to return to the wall. However, if the handrail is located on the closing door wall of a single-slide or two-speed entrance elevator and it projects an abrupt end towards people entering the car, the handrail end must return to the wall.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02340, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02350 What requirements apply to floor designations on elevator door jambs? Floor designations must be:

- (1) Located on both sides of the doorjamb at each hoistway entrance;
- (2) Visible from within the car and from the lobby;
- (3) Positioned on a centerline height of 60 inches above the floor;
- (4) Two inches high and raised 3/10 inch;
- (5) Placed on a contrasting color background; and
- (6) Accompanied by Grade 2 Braille. Permanently attached plates are acceptable.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02350, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02355 What are the installation and operation requirements for hall buttons? (1) The centerline of all hall call buttons must be 42 inches above the floor.

- (2) The "UP" direction button must be on top.
- (3) Raised or flush direction buttons, exclusive of the panel border, must be a minimum of 3/4 inch in size.
- (4) Indicator lights must be installed to show each call registered and they must extinguish when the call is answered.
- (5) When pushed, the depth of flush buttons must not exceed 3/8 inch.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02355, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02360 What are the requirements for installation and operation of hall lanterns? (1) A visual and audible signal must be installed at each hoistway entrance. These signals must indicate, to prospective passenger, which car is responding to the call and the direction the car is traveling.

- (2) The visual signal for each direction must be at least 2 1/2 inches in size and must be visible from the vicinity of the hall call button.
- (3) The audible signal must sound once for "up" and twice for "down".
- (4) The centerline of the lantern fixture must be located at least 6 feet above the floor.
- (5) Hall lanterns may be located either on the jamb or in the car.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02360, filed 12/22/00, effective 1/22/01.]

WAC 296-96-02365 What is required for physically handicapped lifts? All inclined stairway chairlifts and inclined and vertical wheelchair lifts installed only for use by individuals with disabilities and in locations other than a private residence must be equipped with a standard electric switch Chicago style lock and #2252 key.

[Title 296 WAC—p. 1978]

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-02365, filed 12/22/00, effective 1/22/01.]

Material Lifts

WAC 296-96-05010 What are the department's rules on material lifts? (1) These rules define a "material lift" as a fixed stationary conveyance that:

- (a) Has a car or platform moving in guides;
 - (b) Serves two or more floors of a building or structure;
 - (c) Has a vertical rise of at least 5 feet and no more than 60 feet;
 - (d) Has a maximum speed of 50 feet per minute;
 - (e) Is not part of a conveying system but is an isolated self-contained lift;
 - (f) Travels only in an inclined or vertical direction;
 - (g) Is operated or supervised by an individual designated by the employer;
 - (h) Is installed in a commercial or industrial area not accessible to the general public; and
 - (i) May not be operated from within the car.
- (2) Material lift installation and operation must comply with chapter 296-155 WAC (Safety standards for construction work).

(3) Material lifts must not carry people so their operation or failure will not endanger people working near them. WAC 296-96-05010 through 296-96-05290 establishes requirements for the construction, installation, and operation of material lifts. These rules allow certain conveyances designed solely to transport material and equipment to be constructed to less stringent and costly standards than ASME A17.1.

These rules do not apply to conveyances that lack a car (platform) and use rollers, belts, tracks, power conveyors, or similar carrying (loading) surfaces. (See ASME/ANSI B20.1.)

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05010, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05020 What requirements apply to the construction and fire safety of hoistway enclosures? Generally, local codes and ordinances govern hoistway enclosure construction. When not in conflict with a local code requirement, the enclosure must:

- (1) Be built to a height of 7 feet above each floor, landing and adjacent stairway tread;
- (2) Extend (adjacent to the counterweights) the full height of the floor and 8 inches beyond the counterweight raceway;
- (3) Be constructed of either solid material or material with openings that will reject a 2-inch diameter ball; and
- (4) Be supported and braced so that it does not deflect more than 1 inch when subjected to a force of 100 pounds applied perpendicular at any point.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05020, filed 12/22/00, effective 1/22/01.]

(2001 Ed.)

WAC 296-96-05030 What are the construction requirements for hoistway enclosure gates and doors? Enclosure gates (doors) must be constructed according to the following standards:

- (1) The gate must guard the full width of each opening on every landing.
- (2) It must be built in one of the following styles:
 - (a) Vertically sliding;
 - (b) Biparting;
 - (c) Counter-balanced;
 - (d) Horizontally swinging; or
 - (e) Horizontally sliding.
- (3) Be constructed of either solid material or material with openings that will reject a 2-inch diameter ball.
- (4) Be constructed with a distance of not more than 2 1/2 inches between a hoistway gate or hoistway door face and a landing sill edge.
- (5) Be designed and guided to withstand (without being broken, permanently deformed, or displaced from its guides or tracks) a 100 pound lateral pressure applied near its center.
- (6) Employ a combination mechanical lock and electrical contact that prevents the operation of the lift when the doors or gates are open.
- (7) Construct balanced type vertically sliding gates that extend no more than 2 inches vertically from the landing threshold and no less than 66 inches above it.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05030, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05040 What requirements apply to a hoistway that does not extend to the lowest levels of a building or structure? If the space directly below the hoistway is accessible, the following requirements apply:

- (1) All lift counterweights must have safeties.
- (2) All cars and counterweights must have either spring or oil buffers.
- (3) Spring buffers must not fully compress when struck by a car carrying its rated load or by the counterweights when they are moving at the following speeds:
 - (a) For safeties operated by a governor, the tripping speed of the governor is the maximum striking speed.
 - (b) For safeties not operated by a governor, 125 percent of the rated speed is the maximum striking speed.
- (4) Car and counterweight-buffer supports must be able to withstand any impact upon the buffer (without permanent deformation) while occurring at the following speeds:
 - (a) For safeties operated by a governor, the tripping speed of the governor at the rated capacity is the maximum impact speed.
 - (b) For safeties not operated by a governor, 125 percent of the rated speed is the maximum impact speed.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05040, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05050 What requirements apply to lift hoist driving machines? (1) Lift hoist driving machines must be one of the following types:

- (a) Winding drum.

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- (b) Traction.
- (c) Direct plunger.
- (d) Hydraulic.
- (e) Roped or chained hydraulic.
- (f) Rack and pinion.
- (g) Roller chain drive.
- (h) Scissors.
- (i) Screw.

(2) Overhead mounted driving machines must either be secured to the top of overhead beams or supported by the floor above. Hooks, cables, chains or similar devices cannot suspend driving machines.

(3) For traction machines, the diameter of drive sheaves cannot be less than 30 times the diameter of the hoisting cables. The diameters of all other sheaves cannot be less than 21 times this diameter.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05050, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05070 What car enclosure requirements apply to lifts? Lift cars must have their sides enclosed with solid panels or openwork that will reject a 2-inch diameter ball. On the car sides where there is no gate (door), the enclosure must extend to a height of at least 48 inches from the floor. On the car side next to the counterweight runway, the enclosure must extend vertically to the car top or underside of the car crosshead and horizontally to at least 6 inches on each side of the runway.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05070, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05080 How much running clearance is permitted between a car sill and a hoistway? Running clearance between a car sill and a hoistway must not exceed 2 inches.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05080, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05090 What requirements apply to car and counterweight guides? Car and counterweight guide rails must be fastened so they will not deflect more than 1/8 inch. They must also be strong enough to withstand, without deformation, the application of a car safety when the car is carrying its rated load and traveling at its rated speed.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05090, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05100 How much weight can be placed on a car frame and platform during loading and unloading? Car frames and platforms must be designed and constructed per manufacturers' specifications to withstand the impact of the maximum weight encountered during loading and unloading.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05100, filed 12/22/00, effective 1/22/01.]

[Title 296 WAC—p. 1979]

WAC 296-96-05120 What requirements apply to car operating devices, terminal stopping devices and electrical protective devices? If electrically operated, such devices must be enclosed. On lifts driven by winding drum machines, there must be a slack rope device employing an enclosed electric switch (manually reset type) which halts power to the drum and brake when the hoisting rope becomes slack.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05120, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05140 What requirements apply to car safeties? Car safeties must be used on all material lifts that are suspended by wire ropes or chains. They must be able to stop and sustain a car carrying 125 percent of its rated load. On lifts driven by rack and pinion machines:

(1) Car safeties will consist of a freely rotating safety pinion, an overspeed governor and a safety device which may be mounted on the car.

(2) The rotating pinion driving an overspeed governor will travel on a stationary rack which is vertically mounted in the hoistway.

(3) The governor will actuate the safety device when the downward speed of the car reaches the tripping speed and will bring the car to a gradual stop.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05140, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05150 What requirements apply to lift brakes? On electric lifts, brakes must engage by springs and must release electronically. All brakes must have the ability to stop a car and hold it at rest while the car is carrying 125 percent of its rated load. At least one brake must be mounted on the load side of the driving machine's worm shaft. On indirectly driven lifts, brakes must engage when the driving mechanism fails.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05150, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05160 What types of ropes, chains, and rope connections must be used on a lift? (1) The following general requirements apply:

(a) Iron (low carbon steel) or steel wire ropes with fiber cores must be used to suspend cars and counterweights.

(b) The minimum safety factor for suspension ropes must be 6 times the manufacturers rated breaking strength per rope.

(c) The car, the counterweight end of the car and the counterweight wire ropes (or the stationary hitch ends where multiple roping is used) must be fastened so that the looped ends of the turned back portion in the rope sockets are clearly visible. Fastenings must either be:

(i) Individual tapered, babbitted rope sockets; or

(ii) Other types of department approved rope fastenings.

(d) Rope sockets must develop at least 80 percent of the breaking strength of the strongest rope used in the sockets.

(e) U-bolt rope clips (clamps) cannot be used for load fastenings.

[Title 296 WAC—p. 1980]

(f) A metal or plastic data tag must be securely attached to one of the wire rope fastenings each time the ropes are replaced or reshackled. The data tag must include:

(i) The diameter of the ropes in inches; and

(ii) The manufacturer's rated breaking strength.

(iii) All replacements of wire rope or chain must be in accordance with the lift manufacturer's specifications.

(2) The following requirements apply to specific types of material lifts:

(a) Traction type lifts must use at least three hoisting ropes.

(b) Owners, operators and installers of lifts suspended by hoisting chains must comply with the chain manufacturer's specifications for maintenance, inspection, and application.

(c) Lifts using roller chain type lifting chains must use chains with a six to one safety factor based on ASME/ANSI B-29.1M minimum (not average) chain strength.

(d) Drum type lifts, must use either at least two hoisting ropes or a secondary as well as a primary load path to the hoist must be employed. Also, the cable secured to the drum must be at least one and one-half turns around the drum when the carrier is at its extreme limit of travel.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05160, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05170 What requirements apply to lift control stations? Lift control stations must be located at each landing out of reach of the lift car. They must have controls that are permanently and clearly labeled by function. The controls must have a stop switch that will halt electrical power to the driving machine and brake. This stop switch must:

(1) Be manually operated;

(2) Have red operating handles or buttons;

(3) Be conspicuously and permanently marked "STOP"; and

(4) Clearly indicate the stop and run position.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05170, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05190 How must lift pits be constructed? Lift pits must:

(1) Have noncombustible floors;

(2) Be designed to prevent the entry of ground water into the pit;

(3) Have floors that are substantially level;

(4) Have drains that are not directly connected to sewers;

(5) Provide safe and convenient access to the pit;

(6) Provide an approved ladder for pits deeper than 3 feet; and

(7) Have non-perforated metal guards installed on the open sides of the counterweights where spring, solid or oil type buffers are attached. These guards must:

(a) Extend from a point not more than 12 inches above the pit floor to a point at least 7 feet but not more than 8 feet above the floor;

(b) Be fastened to a properly reinforced and braced metal frame which will be at least equal in strength and stiffness to No. 14 U.S. gauge sheet steel; and

(c) Be omitted on the pit side where compensating chains or ropes are attached to the counterweight.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05190, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05200 Which lift landings must be illuminated? All lift landings must be illuminated.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05200, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05210 What signs must be posted on landings and lifts? Each lift must have the following two signs:

(1) A "CAPACITY" sign permanently fastened in the lift car and on each landing. This sign must indicate the rated load of the lift in pounds and be made of metal with 2-inch high black letters on a yellow background.

(2) A "NO RIDERS" sign conspicuously and permanently fastened on the landing side of all hoistway gates (doors) and in the enclosure of each car. This sign must be made of metal with 2-inch high black letters on a red background.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05210, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05220 What electrical wiring standards apply to lifts? All electrical wiring, installations, and equipment in a hoistway, machine room or machinery space must conform to the National Electrical Code in effect at the time of installation or major alteration.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05220, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05230 What safety regulations apply to exposed equipment? All exposed gears, sprockets, sheaves, drums, ropes and chains must be guarded to protect against accidental contact as required by chapter 296-24 WAC (General safety and health standards).

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05230, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05240 What are the minimum maintenance requirements for lifts? All owners, or designated owner representatives, of material lifts described in this chapter are responsible for the maintenance of their lifts and parts. Minimum maintenance requirements are:

(1) All lifts described in this chapter and their parts must be maintained in a safe condition; and

(2) All devices and safeguards that are required by this chapter must be maintained in good working order.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05240, filed 12/22/00, effective 1/22/01.]

(2001 Ed.)

WAC 296-96-05260 When are inspections required? Inspections are required for each lift installation, alteration or relocation and must be conducted at the completion of the job before the lift is placed into service. The inspection must include a safety test at 125 percent of rated load.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05260, filed 12/22/00, effective 1/22/01.]

WAC 296-96-05290 Under what conditions is a five-year test administered? A five-year test of the material lift car and counterweight safety devices must be conducted, and the test must be administered under the following conditions:

(1) Qualified people will conduct the test. A qualified person is either the representative of a firm that manufactures, installs or services material lifts or a person approved by the department.

(2) The car safety devices must be tested while the car is carrying a 100 percent rated load and the counterweight at no load.

(3) A report of the test results must be submitted to the department for approval.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-05290, filed 12/22/00, effective 1/22/01.]

PART C1 - CONSTRUCTION, OPERATION, MAINTENANCE AND INSPECTION OF INCLINED PRIVATE RESIDENCE CONVEYANCE FOR TRANSPORTING PERSON(S) FOR RESIDENTIAL USE

WAC 296-96-07010 What is the scope of these regulations? The rules in this part are the minimum standard for all new and altered inclined private residence elevator for single family use. The purpose of this part is to provide for the safety of all persons riding in or operating an inclined private residence elevator to ensure that no person in proximity of the elevator will be endangered by its operation or failure.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07010, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07020 What is the definition for inclined private residence elevator? "Inclined private residence elevator" means a device constructed and operated for transporting people or property from one elevation to another at an angle of inclination of seventy degrees or less from the horizontal. Essentially, it is a car or platform traveling on guides or guiding members in an inclined plane.

NOTE: For purposes of this chapter, devices installed indoors on stairways that utilize chairs to carry passengers are not considered "inclined passenger elevators."

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07020, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07030 Does the department approve private residence elevator plans and specifications? Yes.
(1) Before commencing construction of any inclined private

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residence elevator the owner must submit complete plans and specifications to the department for approval.

(2) Plans and specifications covering the installation of an inclined private residence elevator must be endorsed by a professional engineer before the department will approve the plans.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07030, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07035 What are the minimum maintenance requirements for inclined private residence elevators? Owners of inclined private residence elevator are responsible for the following:

(1) Maintaining elevators and mechanical parts in a safe condition; and

(2) Ensuring that all devices and safeguards required by these regulations are maintained in good working order.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07035, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07040 What are the clearance requirements for an incline runway? (1) If the car sides extend less than 6 feet above the floor of the car, there must be no obstruction along the runway within 24 inches of the car sides. EXCEPTION: When solid guards are installed on the obstruction in both directions of travel which project at least 14 inches in line with the direction of travel, the running clearance may be reduced to 7 inches. The guard must be arched and the edges rounded to eliminate shear hazard.

(2) Guiding members and moving parts of the inclined private residence elevator must be kept free of brush and other types of material that might either impede the travel or cause deterioration of the equipment over time.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07040, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07050 What are the construction requirements for car landing enclosures and gates for inclined private residence elevators? Any landing enclosures and gates must have:

(1) A railing at least 42 inches high to protect all landing platforms and those areas of a building used as landing platforms; and

(2) A gate whose height is equal to the height of the railing to protect the passenger landing opening.

(a) Gates may either be a horizontally sliding type or a swing type; and

(b) All gates must be equipped with a latch that holds the gate closed and an electrical contact to prevent movement of the car when a gate is open.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07050, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07060 What types of bumpers and buffers must be installed on inclined private residence elevators? (1) If spring or equivalent type buffers are not

being used and rated speeds do not exceed 50 feet per minute, solid bumpers must be installed. Solid bumpers must:

(a) Be built of wood or other suitable resilient material;

(b) Have the ability to resist deterioration from weather;

(c) Have sufficient strength to withstand, without failure, the impact of a descending car carrying its rated load or counterweight and traveling at 115 percent of its rated speed.

(2) Spring type buffers must be installed when speeds exceed 50 feet per minute. Spring buffers must:

(a) Be built with a minimum stroke of 3/4 inch and with a maximum stroke of 1 1/2 inches;

(b) Not fully compress when struck by a car carrying its rated load or counterweight and traveling at 115 percent of its rated speed.

(3) Inclined private residence elevators are not required to have bumpers and buffers except when obstructions are encountered.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07060, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07070 What are the requirements for machinery beams and supports? (1) All machinery and sheaves must be sufficiently secured and supported to prevent any part from becoming loose or displaced. Beams directly supporting machinery must be made of steel, sound timber or reinforced concrete.

(2) Beams and support loads must be computed as follows:

(a) The total load on the beams must be equal to the weight of all apparatus resting on the beams plus twice the maximum load suspended from the beams.

(b) The load resting on the beams must include the complete weights of the driving machine, sheaves, controller, etc.

(c) The load suspended from the beams must include the sum of the tensions in all ropes suspended from the beams.

(3) The elevator driving machine or sheaves must not be fastened to the underside of the supporting beams at the top of the hoistway. EXCEPTION: Cast iron in tension must not be used for supporting members for idler and deflecting sheaves where hung beneath beams.

(4) The factor of safety for beams and supports must be no less than:

(a) Five for steel; and

(b) Six for timber and reinforced concrete.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07070, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07080 What are the load and size requirements for car platforms? (1) The rated load of a platform must not exceed 700 pounds.

(2) The inside net platform area must not exceed 12 square feet. EXCEPTION: the net platform area may be increased by no more than 3 square feet provided that shelves or benches permanently affixed to the car structure reduce the standing area to 12 square feet.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07080, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07090 What is the maximum rated speed of an incline elevator? The maximum rated speed of an incline elevator, measured along the incline, is 75 feet per minute.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07090, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07100 What construction requirements apply to incline elevators? (1) Incline elevator car frames and platforms must:

(a) Be built of metal, a combination of metal and wood or other materials of equal strength;

(b) Have a safety factor of at least five; and

(c) Be suitably prepared and/or protected for exposure to weather.

(2) Incline car chassis must:

(a) Be built of metal, except for the guiding members, and

(b) Have a safety factor of at least 5, based upon the car's rated load.

(c) Chassis guiding members must be retained and/or enclosed in guides so that the chassis cannot be derailed.

(3) Cast iron may not be used in the construction of a car frame or chassis.

(4) A car may have only one compartment.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07100, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07110 What construction requirements apply to car enclosures? Car enclosures must be:

(1) Enclosed on all sides, except at the entrance, to a height of at least 42 inches;

(2) Enclosed with a type of material that will reject a 1 1/2 inch diameter ball;

(3) Securely fastened to the car platform so that it cannot become loose or displaced due to ordinary service, application of the car safety, or car contact with a buffer.

(4) Built to withstand a 75 pound pressure, horizontally applied at any point on the wall, without causing a wall deflection that reduces running clearance below 3/4 inch or above 1 inch.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07110, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07120 What construction requirements apply to car doors and gates? (1) All car entrances must be protected by a door or gate. The height of the door or gate must be at least 42 inches and equal to the height of the car enclosure. Doors and gates may be either of a solid design or an openwork design. If of an openwork design, the door or gate must be able to reject a 3-inch diameter ball.

(2) Car doors or gates must be equipped with an electric contact that prevents the elevator from operating unless the door or gate is securely closed. If the gate is a swing type opening outward from the car, the electric contact must not be made until the gate is securely latched.

(3) All car doors or gates must be manually operated.

(2001 Ed.)

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07120, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07130 What type of glass or plastic can be used in a car enclosure? Weather resistant plastic and tempered safety glass may be used in car enclosures.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07130, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07140 Are capacity and data plates required? (1) The manufacturer must install a weather resistant capacity plate. It must be securely fastened to the car in a conspicuous place and state the car's rated load in pounds using letters at least 1/4 inch high.

(2) The manufacturer must install a metal data plate showing the car's weight, speed, suspension means data, manufacturer's name and date of installation. The data plate must be securely fastened in a conspicuous place in the machine area.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07140, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07150 What are the construction requirements for guide rails, track supports and fastenings? (1) Guides, guide rails, guide rail brackets, splice plates, and fastenings must be made of steel or other metals conforming to the requirements of this section.

(2) Guides, guide rails, guide rail brackets, and their fastenings and supports must, at the point of support, deflect 1/8 inch or less while resisting horizontal forces encountered during loading. When horizontal force is measured at a mid-point between brackets, guide rails must deflect 1/4 inch or less in any direction.

(3) The top and bottom of each guide or guide rail run must not allow a car and counterweight guiding members to travel beyond the guide rail ends.

(4) Guides for inclined private residence elevators must have no more stresses and deflection than allowed by the manufacturer's specifications.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07150, filed 12/22/00, effective 1/22/01.]

WAC 296-96-07160 What construction requirements apply to counterweights? (1) Counterweights, where used, must be in a guide or guiding members.

(2) Counterweights must not be of sufficient weight to cause undue slackening of any car hoisting rope or chain during acceleration or retardation of the car. Counterweight weight section must be mounted in structural or formed metal frames which are designed to retain weights securely in place.

EXCEPTION: Counterweights may be constructed of a single metal plate.

[Statutory Authority: RCW 70.87.020, 70.87.030, 70.87.034, 70.87.120, 70.87.185 and chapter 70.87 RCW. 01-02-026, § 296-96-07160, filed 12/22/00, effective 1/22/01.]